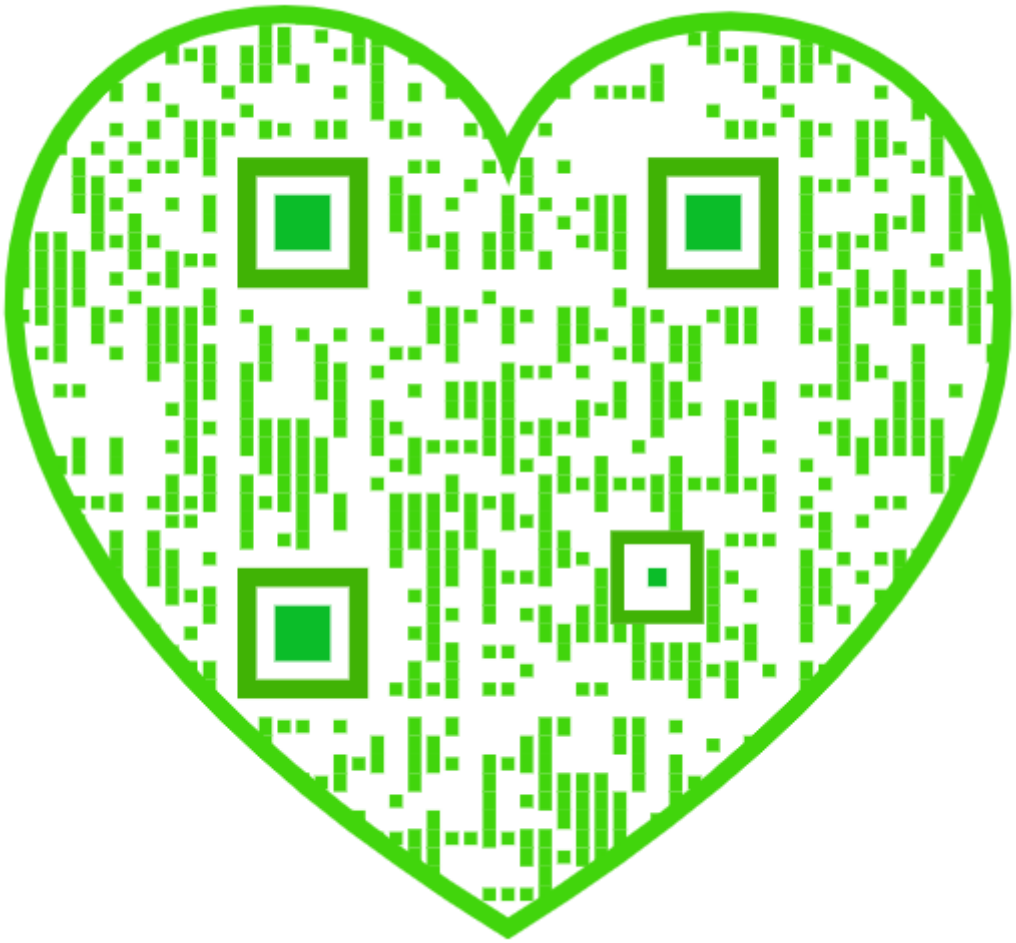
MANUAL OF WEAVE CONSTRUCTION

KASTANEK

TS
1490
.K21

LORD'S TEXTILE MANUALS



Class

Book

Copyright No.

COPYRIGHT DEPOSIT.

A MANUAL

OF

WEAVE CONSTRUCTION

A SYSTEMATIC ARRANGEMENT AND EXPLANATION
OF THE FOUNDATION AND DERIVATIVE
WEAVES FOR HARNESS LOOMS

BY

IVO KASTANEK

Professor of Designing and Weaving at the Royal Textile College, Brunn, Austria

TRANSLATED AND ARRANGED FOR AMERICAN AND ENGLISH
PRACTICE BY

SAMUEL S. DALE

Editor of the "Textile World," Boston, Mass.

OVER 500 ILLUSTRATIONS AND DIAGRAMS

PUBLISHED BY

GUILD & LORD, BOSTON, MASS.

(PUBLISHERS OF THE "TEXTILE WORLD")

THE LIBRARY OF CONGRESS
Two Copies Received
MAR 1 1903
Copyright Entry
Jan. 23-903
CLASS A XXc. No.
5142
COPY B.

COPYRIGHT, 1903
BY
GUILD & LORD, BOSTON

TRANSLATOR'S PREFACE.

The following pages contain the first systematically classified treatise on weave construction to be published in the English language. The weaves are divided into the three general classes, plain, twill, and satin; under each of these divisions are given rules for constructing derivative weaves, which are illustrated with over 500 drafts, diagrams, and illustrations of cloth samples.

The object of the work is to give in as few words as possible a comprehensive treatise on weave construction. The information it contains, once acquired, will enable the student to construct derivative weaves, of which the number is unlimited, to suit requirements as they arise.

The distinctive features of the book are: —

1. Systematic Classification.

2. Concise and Clear Explanations.

3. Illustrations of both Weave Drafts and Cloth Samples.

For self-instruction, the workers in the mill who are deprived of the opportunity to attend a textile school will find it of great value. It will be found equally well adapted for the practical weaver and the student, for the mill as well as for the school.

SAMUEL S. DALE.

Boston, Feb. 20, 1903.

TABLE OF CONTENTS.

	PAGE
Basket or Panama Weaves	8
Boucle, Imitation	26
Braid	2
Catch Thread in Selvage	8
Checkerboard Weaves	86
Checks, Irregular	88
Color Effects	78
Color Effects by Transposing Twills	58
Corkscrew Weaves	68
" " Figured	71, 76
" " Filling	68
" " Irregular	70
" " Mosaic	71
" " Stitched	72
" " Warp	68
Cotton or Plain Weaves	6
Crepe Weaves	74
Design Paper	3
Dobby Loom	5
Double Beam Warps	99
Drawing-in of Filling at Selvage	8
Drawing-in Drafts	80
" " Broken	82
" " Cross	82
" " Divided	82
" " Double	82
" " Grouped	82
" " Intermittent	82
" " Manifold or Corkscrew	82
" " Pointed	82
" " Satin or Scattered	82
" " Straight	82
Effects by Changing Position of Colors	56
Fabric, Set of	40
" Spongy	40
Face Goods	34
Felt	34
Filling	3
Gauze	2

PAGE
Ground Weaves and their Derivatives 6
Hairlines 92
Harness Frames 5
Heddles 5
Honeycomb Weaves 90
Introduction 1
Jacquard Motion 5
Knitted Fabrics 2
Lace 2
Leno 2
Mails 5
Motives 100
Panama or Basket Weaves 8
Paper 2
Pattern 3
Pin Checks 84
Plaids 99
Plain or Cotton Weaves 6
Plain Weaves, Color Effects by Transposing 32
Plain Weaves, Figured 24
Plain Weaves, Interlaced Effects in 28
Prints on Design Paper 4
Rib Weaves 10
" " Cross 10
" " Cross and Long Combined 20
" " Extra Stitching Threads 16
" " Figured 18
" " Irregular 14
" " Long 10
" " Mixed 10, 12
" " Mixed Long 12
" " Plain (cannele) 10
" " Selvage for 12
" " Stitched 16
" " Stock for 12
Satin Weaves 62
" " Drafting 62
" " Irregular 62, 64
" " Regular 62
" " Shaded 62
" " Stitched 62, 66
" " with Two or More Rising Numbers 64
Shafts 5
Single Weave, Variation of 94
Take-up 97
Tension, Uneven 97
Twills 34
" Angle of 34

PAGE
Twills, Angle of Dovetail 53
" Balanced 34
" Batavia 36
" Broken 50
" Combination 44
" Cross Zigzag 55
" Cross or Zigzag 54
" Curved 48
" Deflected 48
" Diagonal 55
" Dovetail 52
" Fancy 42
" Fancy Filling 46
" Felt 38
" Fish Scale 46
" Influence of Yarn Twist on 34
" Long Zigzag 55
" Normal 36
" Rib 45
" Shaded 43
" Steep 38
" Stitched 40
" Undulated 48
" Wide Diagonals from 52
Warp 2
Warp Satin Weaves, Figured 76

INTRODUCTION.

A treatise on weaving may be divided into three parts:

1. Intersection of two sets of threads forming a woven fabric;

2. The dissection of a woven fabric to determine the method by which its two systems of threads are interlaced;

3. The mechanical operations by which yarn is converted into a woven fabric.

The first division, relating to shaft weaving, will form the subject of the following pages, and only such fabrics will be considered as are made by the simple interlacing of two sets of threads running at right angles to each other, such as the one illustrated at Figs. 1 and 1a.

By this limitation in the scope of our treatise, a number of fabrics will be excluded from consideration, among which may be mentioned:

1. Knitted fabrics, formed by the successive looping of one thread, Figs. 2 and 2a;

2. The various kinds of lace and braid; these are formed by intersecting several systems of yarn at various angles to each other, Figs. 3 and 4;

3. Felt, paper and the like, which are formed, not by intersecting threads, but by the matting together of individual fibres.

Gauze or leno fabrics, Figs. 5 and 5a, will be treated in another work.

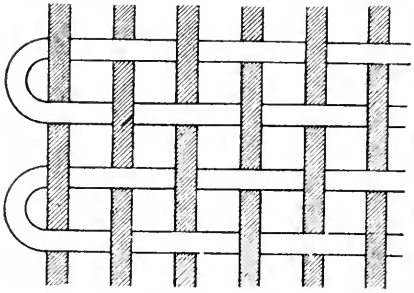


Fig. 1

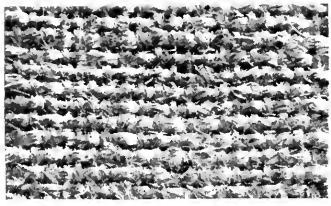


Fig. 1a.

In a fabric composed of two sets of yarn intersecting each other at right angles, the yarn running lengthwise of the cloth is called the warp; that running crosswise, the

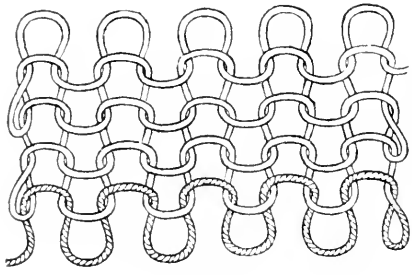


Fig. 2.

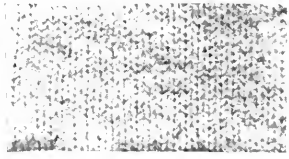


Fig. 2a.

filling, weft or woof. The fabric is formed by bringing each warp thread alternately above and below the filling threads in a predetermined order covering a certain number of threads called the pattern.

The plan or draft of a weave is sketched on design paper, Fig. 6 (8 by 8), Fig. 7 (8 by 14), Fig. 8 (8 by 16), Fig. 9 (10 by 10).

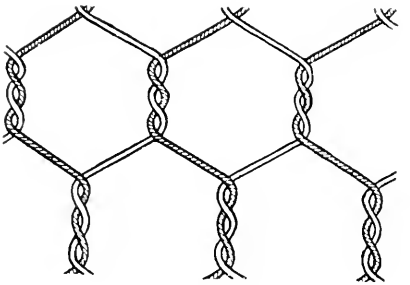


Fig. 3.

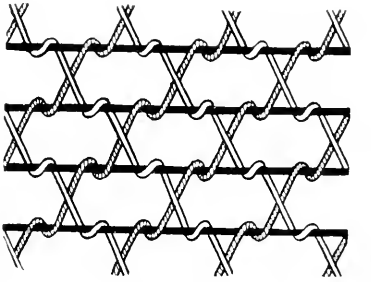


Fig. 4.

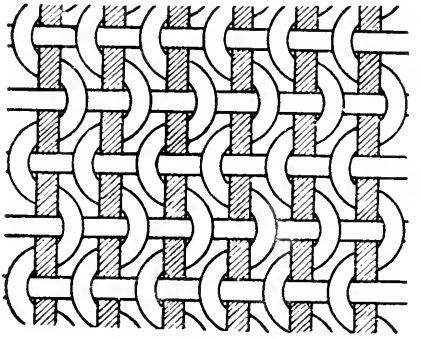


Fig. 5

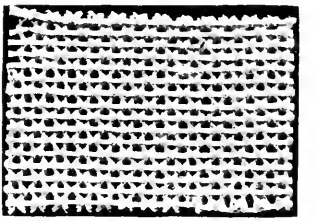


Fig. 5a.

The space between two adjacent upright lines represents a warp thread, and that between two adjacent horizontal lines a filling thread.

At the intersection of a warp and a filling thread, unless otherwise stated (×), (■), (ǁ), or (═), indicate that the warp is above the filling, and a white square that the warp is under the filling.

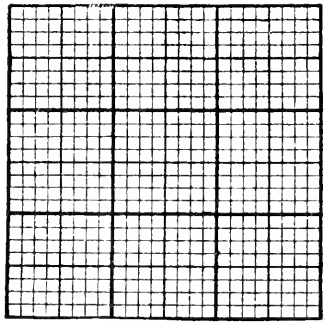


Fig. 6.

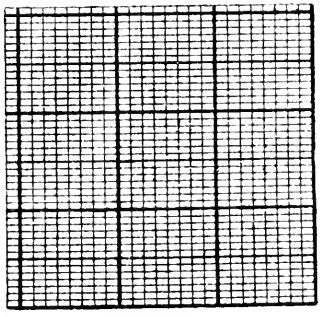


Fig. 7

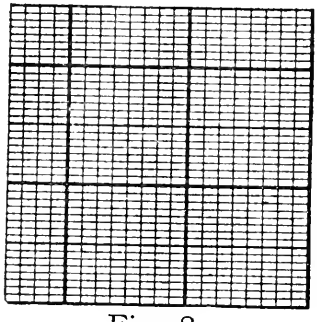


Fig. 8.

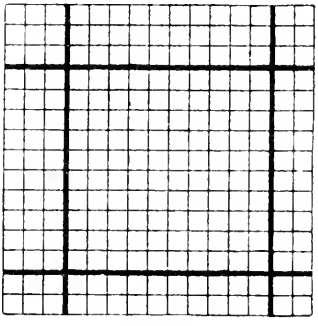


Fig. 9.

The ratio of the number of upright lines to the number of horizontal lines per inch depends upon the threads of warp and filling per inch in the goods. In most cases design paper with an equal number of lines per inch in each direction is used.

To facilitate the reading of the draft, one line is made heavier than the other at regular intervals.

In weaving, the warp threads are arranged in lines parallel to each other and lying in one plane; they are drawn through the eyes of heddles or mails, which are supported either in harness frames (shafts) or by cords connected with hooks.

All warp threads that intersect the filling threads in the same order can be operated by the same shaft or hook, consequently, there must be at least as many shafts or hooks as there are threads intersecting the filling in a different order. In practice, more shafts or hooks are used for the warp than the weave actually requires. There must be as many filling spaces or bars in the weave draft as there are threads in the filling pattern.

The order in which the warp threads are drawn through the heddles is called the drawing-in draft. When the pattern is small enough, it can be woven on what is called a dobby loom, which has but a small number of shafts.

If the pattern is larger than can be woven on the dobby loom, a jacquard motion is employed. The number of different effects or designs that can be made increases with the number of threads in the pattern.

Weaves are classified under a number of subdivisions, each having a typical or ground weave from which others are obtained by systematic alterations or by combination with other ground weaves.

Ground Weaves and their Derivatives.

PLAIN OR COTTON WEAVE.

This is a weave in which the intersection of the warp and filling is repeated at each second thread, making the number of intersections greater than in any other weave.

Fig. 10 is a plain weave; Fig. 10a, the cloth woven with it. One repeat of the weave shown in the lower left hand corner of Fig. 10 is indicated by (×).

The position of the warp and filling threads is best shown by sectional plans of the cloth.

Figs. 11 and 12 show cross sections of a plain weave, the ends of the warp being represented by the small shaded circles; a section of a plain weave taken lengthwise, i. e., with the warp, would be the same. Both sides of a fabric woven with a plain weave usually have the same appearance.

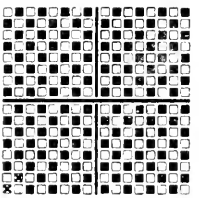


Fig. 10.

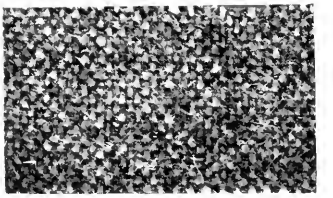


Fig. 10a.

Fig. 11.

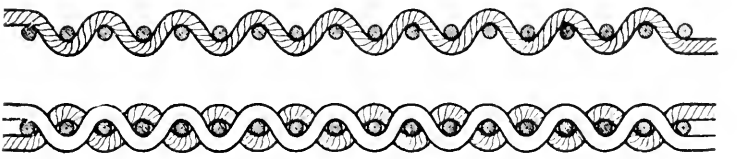


Fig. 12.

BASKET OR PANAMA WEAVES.

These are weaves where two or more adjacent warp and filling threads intersect the opposite system of threads in the same order.

Fig. 13 shows a basket weave in which two adjacent threads work together; this is usually called a 4-leaf basket, since there are four threads in the pattern. Fig. 13a is a 4-leaf basket cloth.

Fig. 14 is a 6-leaf basket, in which three adjacent threads work together; Fig. 15, an 8-leaf basket, in which four adjacent threads work together. Other weaves of this class are shown at Figs. 16, 17, 18 and 19. Fig. 17a is the cloth woven with Fig. 17.

Weaves like the one at Fig. 18 are used when the fabric contains more threads per inch in the filling than in the warp, or in other words, when the warp is more loosely set than the filling.

Although the plain and basket weaves can be woven on two shafts, the number actually used is regulated to a certain extent by the threads per inch, or in other words, by the set of the warp. An increase in the number of threads in the warp necessitates the use of more shafts to avoid an excess of heddles on one shaft and chafing of the warp yarn in weaving.

To prevent drawing in of the filling at the sides of the cloth when weaving with basket weaves, the selvage is woven with a plain weave. One warp thread woven in the selvage with a plain weave and called the catch thread, is sufficient for this purpose.

Figs. 20 and 21 show cross sections of a 4-leaf basket weave.

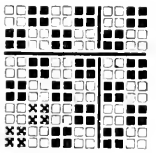


Fig. 13.

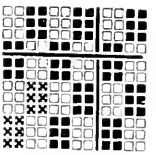


Fig. 18.

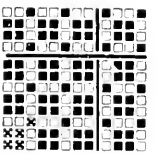


Fig. 19.

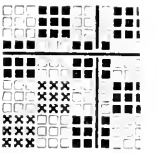


Fig. 14.

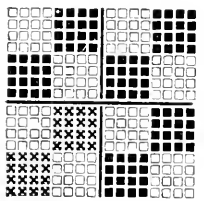


Fig. 15.

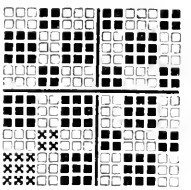


Fig. 16.

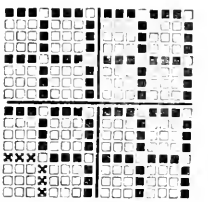


Fig. 17.

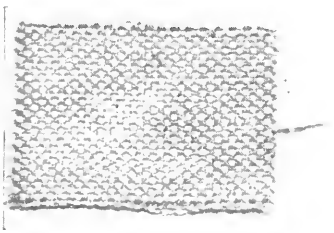


Fig. 13a.

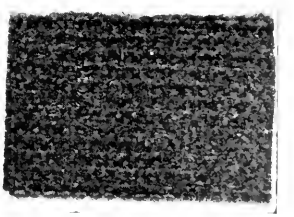


Fig. 17a.

Fig. 20.

Fig. 21.

RIB WEAVES.

If two or more filling threads are woven in each shed of a plain weave, a ribbed effect running crosswise of the cloth is produced. If two or more warp threads are drawn through the same heddle, a ribbed effect is produced with a plain weave, but running lengthwise of the cloth.

Rib weaves are either plain or mixed.

In a plain rib the same number of threads work together to form the rib, and consequently the ribs are all alike.

In a cross rib the threads working together to form the rib vary in number, causing the ribs to vary in size.

Rib weaves are called cross ribs or long ribs, according to the direction in which the rib runs.

In cross ribs, only the warp threads come to the surface. In long ribs, only the filling threads float on the face.

PLAIN RIBS. (Cannelé.)

Figs. 22, 23 and 24 are plain cross ribs. Fig. 22 has 2 filling threads woven in each shed and is the simplest of the three.

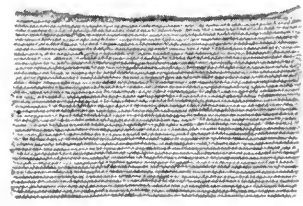


Fig. 23a.

Ribs are made heavier either by weaving more filling threads in a shed, or by using a coarser filling yarn. Instead of using a heavier filling yarn, which generally causes uneven ribs, it is better to use a fine yarn with two or more threads wound together on the bobbin.

Figs. 25, 26 and 27 are long ribs. Fig. 25 is also called a twist weave.

Fig. 28 is a section taken lengthwise, and Fig. 29 a section crosswise of the cross rib, Fig. 22, which is woven with two picks in a shed.

Fig. 23a is the cloth corresponding to Fig. 23.

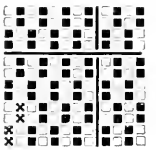


Fig. 22.

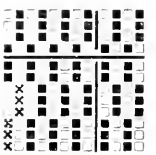


Fig. 23.

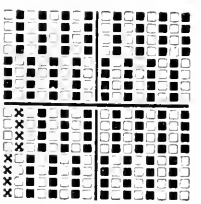


Fig. 24.

Fig. 28.

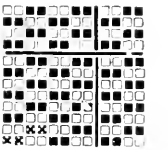


Fig. 25.

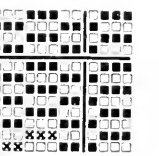


Fig. 26.

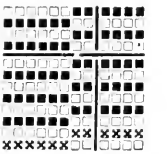


Fig. 27.

Fig. 29.

MIXED RIBS.

These have different sized ribs in the same weave and are classified as long and cross ribs.

Figs. 30 to 36 are mixed cross ribs.

Figs. 37, 38 and 39 are mixed long ribs.

Fig. 30 is used chiefly for ladies' dress goods, upholstery fabrics and vestings; Fig. 30a shows the cloth woven with Fig. 30.

All of the weaves so far referred to have but two warp threads intersecting the filling in different orders, and can, therefore, be woven with two shafts.

The selvage for cross ribs is woven with a cotton weave.

Cheaper material may be used for the filling of cross ribs, as the filling threads do not come to the surface on either side of the cloth.

Likewise, cheaper material may be used for the warp of long ribs, since the warp threads do not come to the surface of these fabrics.

A part of the warp yarn for the weave shown at Fig. 31 may be made of cheaper material; thus the warp may be dressed, 2 wool, 1 cotton, or 2 silk, 1 cotton.

Fig. 31a shows a fabric woven with this weave.

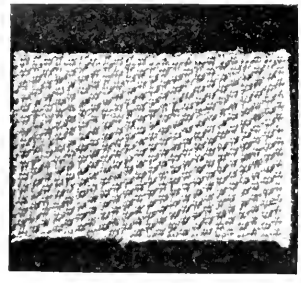


Fig. 39a.

Fig. 39a is a fabric woven with Fig. 39.

Figs. 40 and 41 are sections taken lengthwise of the mixed rib shown at Fig. 34.

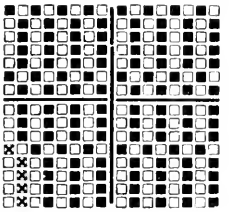


Fig. 30.

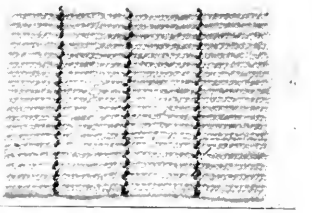


Fig. 30a.

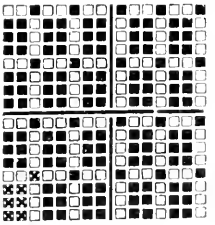


Fig. 31.

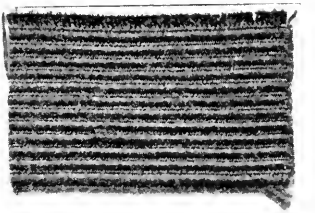


Fig. 31a.

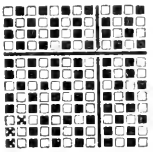


Fig. 32.

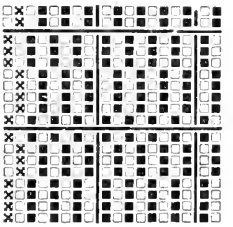


Fig. 33.

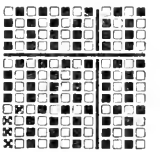


Fig. 34.

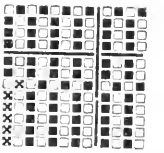


Fig. 35.

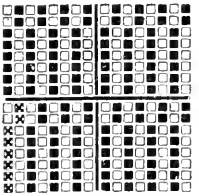


Fig. 36.

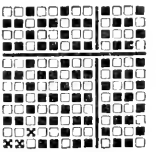


Fig. 37.

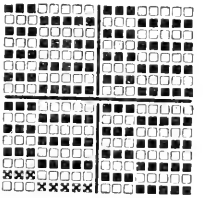


Fig. 38.

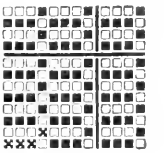


Fig. 39.

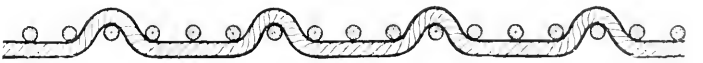


Fig. 40.

Fig. 41.

IRREGULAR RIBS.

These are made by breaking up either plain or mixed ribs.

Fig. 42 shows an irregular rib in which the order of intersection of the warp with the filling is broken at the end of each four warp threads.

Figs. 42, 43, 44 and 49 are irregular ribs derived from plain ribs.

Figs. 45, 46, 47 and 48 are derived from mixed ribs.

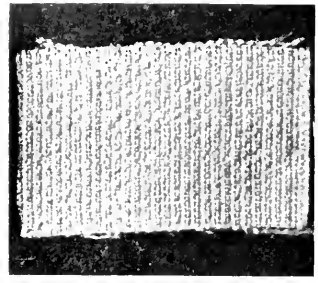


Fig. 43a.

Fig. 43a shows the cloth corresponding to Fig. 43, except that the repeat of the weave covers 6 threads instead of 8 as shown at Fig. 43.

Irregular ribs are also made by altering long ribs, Figs. 50 and 51.

Fig. 52 is a cross section of Fig. 42.

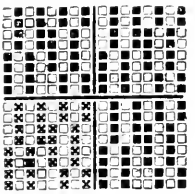


Fig 42

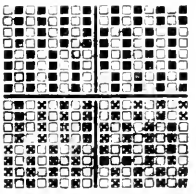


Fig. 43

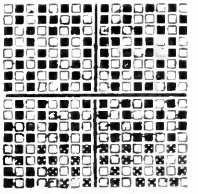


Fig. 44.

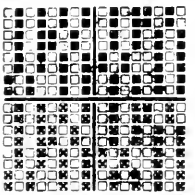


Fig. 45.

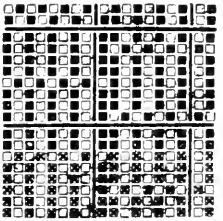


Fig. 46.

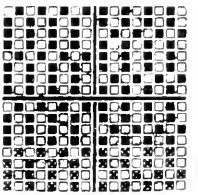


Fig. 47.

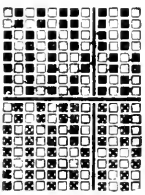


Fig. 48.

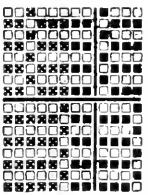


Fig. 50.

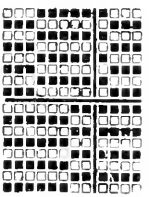


Fig. 51.

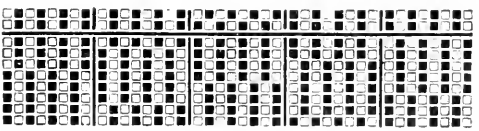


Fig. 49.

Fig. 52.

STITCHED RIBS.

These weaves are used chiefly in the manufacture of worsted goods for fancy effects in which rib are combined with other weaves to form stripes and checks.

The rib weaves in such cases are stitched to make the cloth firmer. This is accomplished in cross ribs by raising the warp thread over a single pick and is shown in Figs. 53, 54, 55 and 56 by (!!) in one pattern at the lower left hand corner of the draft.

In long ribs it is accomplished by raising the filling above a single warp thread in the space where the filling would otherwise float without interruption on the back, and is shown in Figs. 57 and 58 by white squares which break the filling floats on the back.

Weaves 53 to 56 are used chiefly for ladies' dress goods.

Another method of increasing the solidity of cloth woven with a rib weave consists in using special threads as at Figs. 59, 60 and 61, which intersect the opposite set of threads more frequently than do the regular rib threads. These extra threads must be very fine and their number depends upon the degree of firmness desired.

Fig. 66 shows the curvature of the warp thread in the ground weave in Fig. 62. Fig. 67 shows the straight position of a warp thread in the rib weave in Fig. 62. The warp threads in the rib part of the weave have no curvature but lie perfectly straight, consequently they are slacker while weaving, if wound on the same beam as the rest of the warp.

Figs. 63, 64 and 65 are stripes made by combining rib with other weaves. Here the ribs have been stitched to make the fabric firmer.

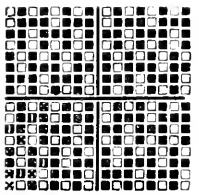


Fig. 53.

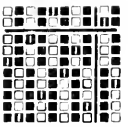


Fig. 54.

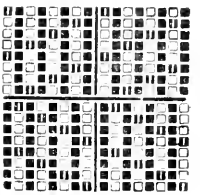


Fig. 55

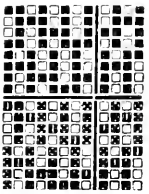


Fig. 56.

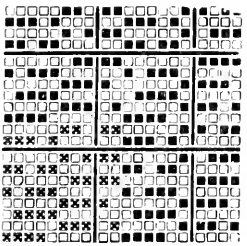


Fig. 57.

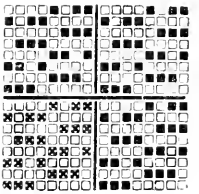


Fig. 58.

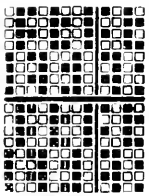


Fig. 59.

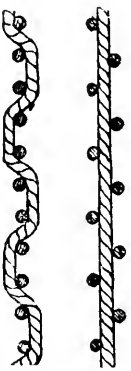


Fig. 66.

Fig. 67.

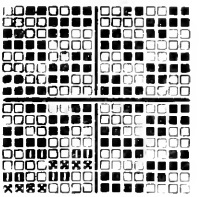


Fig. 60.

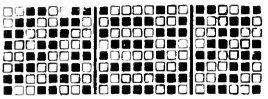


Fig. 62.

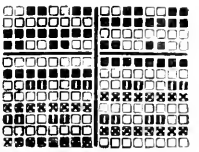


Fig. 61.

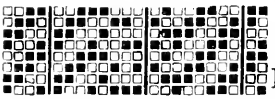


Fig. 63

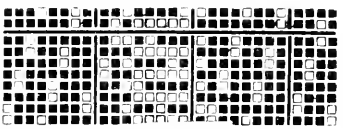


Fig. 64.

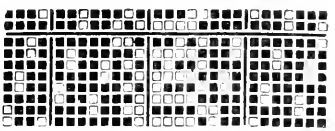


Fig. 65.

FIGURED RIBS.

The figure is formed by floating either warp or filling, or both on a rib weave.

In drafting figured ribs the figure is first drawn, as shown at Figs. 68a and 69a, but on design paper.

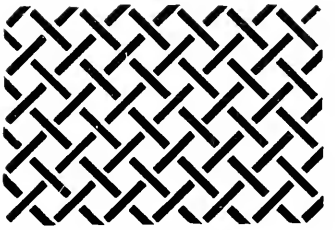
The ground rib weave is then filled in over the whole surface. Then the floats of warp or filling which are to make the figure are formed by inserting risers for warp floats, or by removing risers to form filling floats, Figs. 68 and 69.

Figs. 68b and 69b are fabrics woven with Figs. 68 and 69 respectively.

If the figure is first sketched, on design paper, each point must correspond to at least two risers of the weave.

For example, the motive, Fig. 70 covers four points. The weave, Fig. 71, covers 16 points. Each point in Fig. 70 corresponds to two risers in Fig. 71.

Fig. 68a.



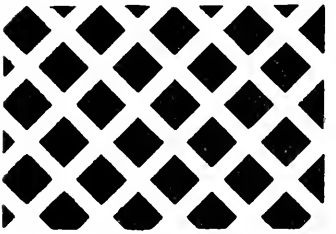


Fig. 69a.

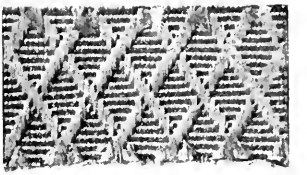


Fig. 68b.

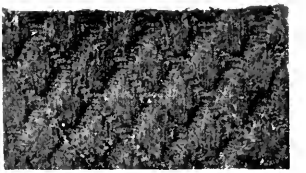


Fig. 69b.

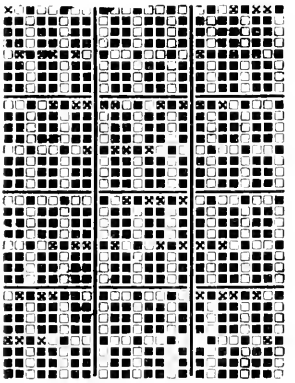


Fig. 68.

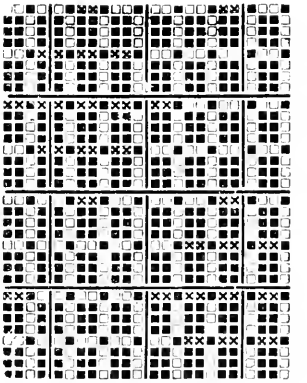


Fig. 69.

Figs. 70 to 73 are figured cross ribs in which the figure is formed by inserting risers, indicated by (×), and converting two or more repeats of the ground weave into one warp float.

Fig. 75 is a figured long rib in which the figure is formed by removing a riser and thus converting two filling floats into one.

Pleasing effects can be obtained by combining both long and cross ribs in the same weave. Fig. 74 is an example.

Fig. 76 is a cross rib: dressed, 2 red 1 black; woven, 3 red 1 black. The figure is formed by combining the warp floats for 16 warp threads on the same pick. This operation is then continued for 13 warp threads on the fourth pick from the one previously altered. The risers inserted to lengthen the float are indicated by (×). Fig. 76a is the cloth thus woven.

FIGURED EFFECTS BY COMBINING CROSS AND LONG RIBS.

The most elaborate effects in figured ribs are made by a combination of cross and long ribs. The accompanying Figs. 77 to 83 are examples of such designs.

Fig. 77a is a motive selected for the design. The number of threads in the pattern is next fixed upon, in this case 16, and the motive painted on the drafting paper as indicated by (×), Fig. 77b, to cover the 16 threads.

The filling rib weave is then marked on the painted portion of the design, and the rest of the pattern filled in with a warp rib weave.

Fig. 77 shows the completed draft. (×) represents sinkers.

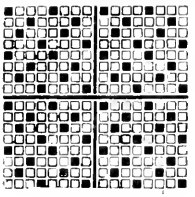


Fig. 70.

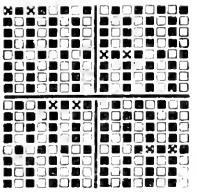


Fig. 71.

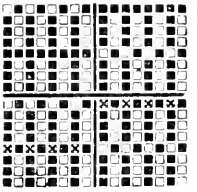


Fig. 72.

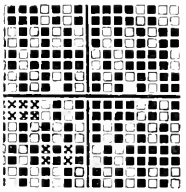


Fig. 73.

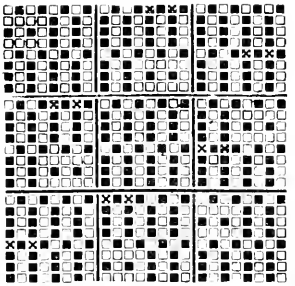


Fig. 74.

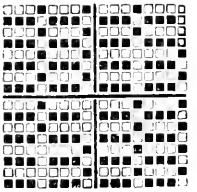


Fig. 75.

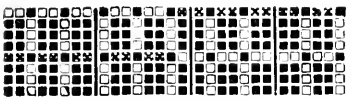


Fig. 76

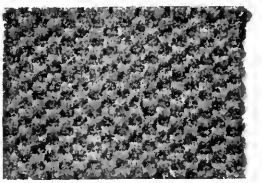


Fig. 76a.

FIGURED EFFECTS BY COMBINING CROSS AND LONG RIBS.

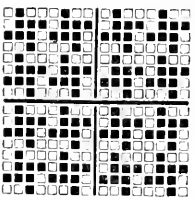


Fig. 77a.

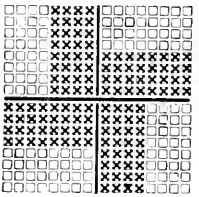


Fig. 77b.

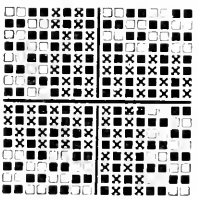


Fig. 77.

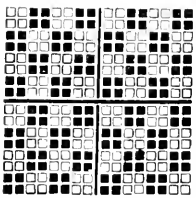


Fig. 78a.

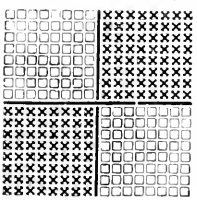


Fig. 78b.

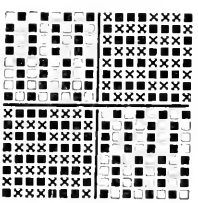


Fig. 78.

Sometimes the rib weave and the threads allowed for it do not come out even. In such cases the odd threads are woven with plain weaves as shown at Fig. 78.

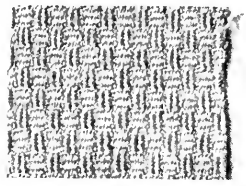


Fig. 78c.

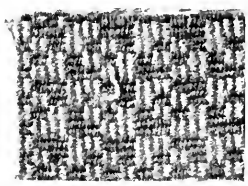


Fig. 83b.

Fig. 78a is the motive, and Fig. 78b the draft, painted to receive the weave.

Fig. 78c shows the cloth corresponding to Fig. 78.

Figs. 79a, 80a, 81a, 82a and 83a are motives corresponding with the completed drafts, Figs. 79, 80, 81, 82 and 83 respectively.

Fig. 83b shows the cloth corresponding to Fig. 83.

In Figs. 77, 78, 79, 80, 81, 82 and 83 (×) represents sinkers, where the warp passes under the filling.

Fig. 79a.

Fig. 80a

Fig. 81a.

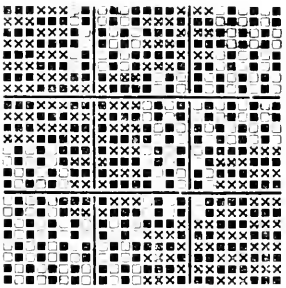


Fig. 79.

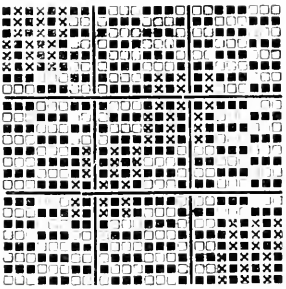


Fig. 81.

Fig. 82a.

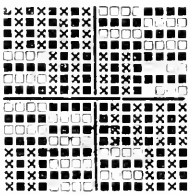


Fig. 80.

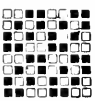


Fig. 83a.

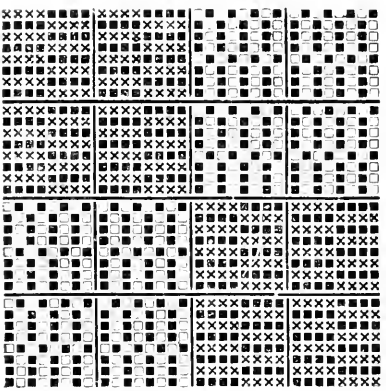


Fig. 82.

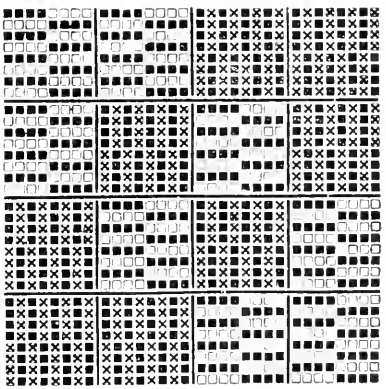


Fig. 83.

FIGURED PLAIN WEAVES.

Figures are formed by floats on a plain weave in the same way as with figured ribs. First, the plain weave is marked on a draft covering the number of threads in the pattern; then the motive, Fig. 89a, is reproduced on the draft by filling in risers (×), to make floats, Fig. 89.

These weaves are used chiefly for cotton, linen and silk goods, and for cotton or worsted warps woven with mohair or luster filling.

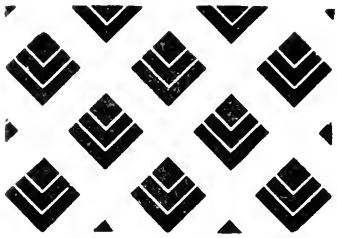


Fig. 89a.

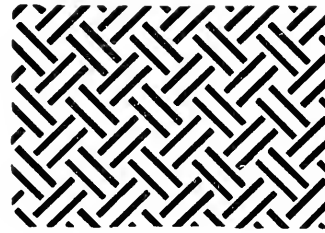


Fig. 90a.

If the figure is to be formed by filling floats, risers must be removed instead of added.

Fig. 88 shows a draft containing both warp and filling floats.

Figs. 84 to 90 are other examples of figured plain weaves.

Figs. 84a, 87a and 88a show cloth woven with Figs. 84, 87 and 88 respectively.

Figs. 89a and 90a are the motives for Figs. 89 and 90 respectively.

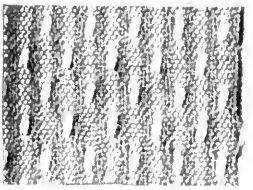


Fig. 84a.

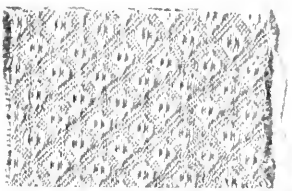


Fig. 87a.

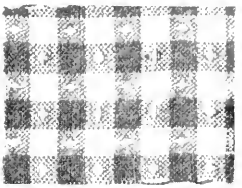


Fig. 88a.

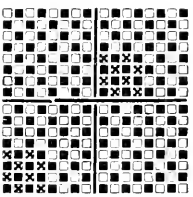


Fig. 84.

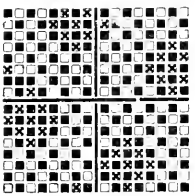


Fig. 85.

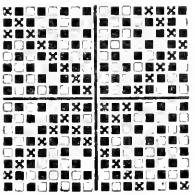


Fig. 86.

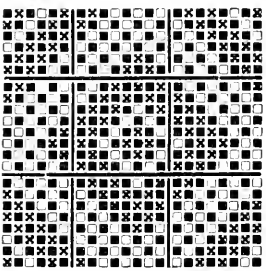


Fig. 87.

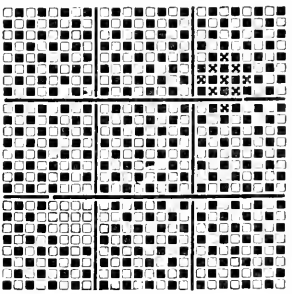


Fig. 88.

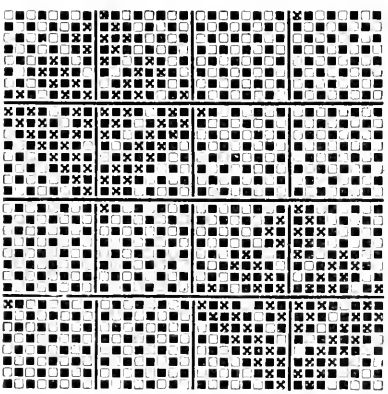


Fig. 89

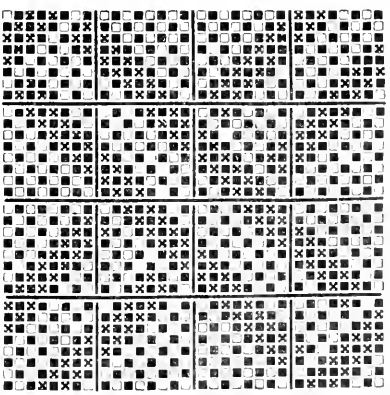


Fig. 90.

IMITATION BOUCLÉ.

The loop for the genuine bouclé is made on the yarn. The effect produced by these loops in the goods can be imitated either by a warp pile or by weaving the goods so that the filling threads float on the surface and curl up when the goods are fulled.

The appearance of the boucle depends upon the way in which the filling floats on the face. These floats may be scattered so that the face of the cloth presents a regular appearance, or they may be arranged to form twills and other effects.

The farther the filling floats the larger will be the loop. The warp is generally made of cotton, and the looped filling of mohair.

Figs. 91 to 97 show weaves for these effects; the

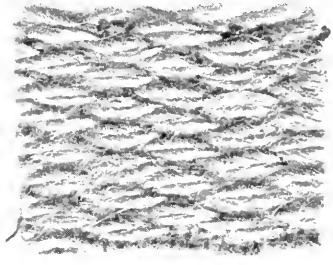


Fig. 91a.

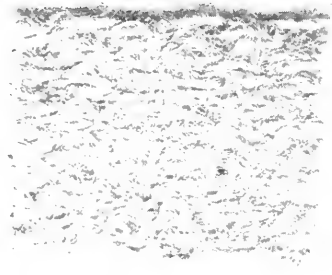


Fig. 91b.

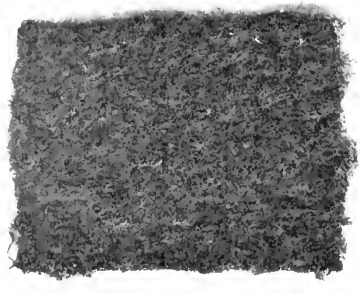


Fig. 97a.

risers are represented by white squares and the sinkers by (×) and (■).

Fig. 91a shows the cloth woven with Fig. 91, and as it comes from the loom.

Fig. 91b is the same cloth fulled.

Fig. 97a is the finished cloth woven with Fig. 97.

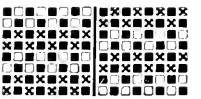


Fig. 91.

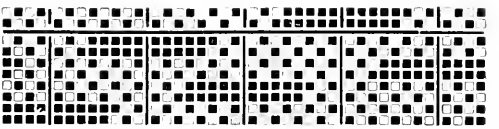


Fig. 92.

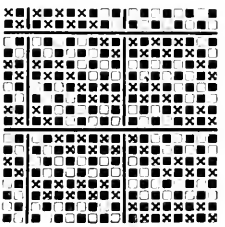
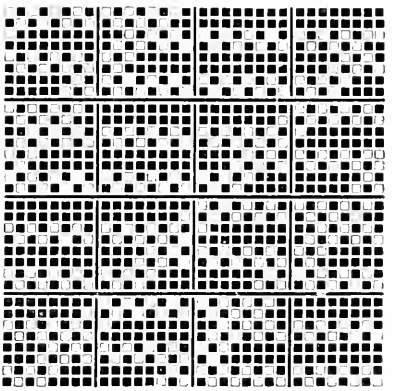


Fig. 93.



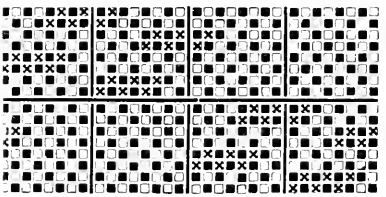


Fig. 94.

Fig. 95.

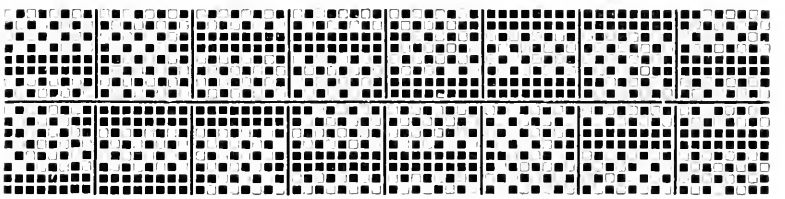


Fig 96.

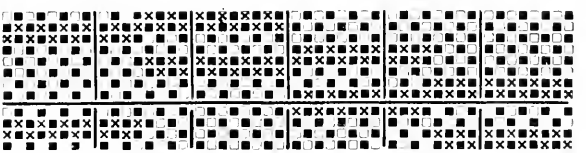


Fig. 97.

INTERLACED EFFECTS IN PLAIN WEAVES.

With warp and filling of the same color different effects can be obtained by changing the weave, the raw material, or the finish of the goods.

By using two or more colors in warp or filling, checks and stripes can be produced. The appearance of the goods depends in great measure upon the weave employed.

A draft of the color effect can be made in advance of the actual manufacture of the goods. The warp pattern is marked above the chain draft, as at Fig. 98, and the filling pattern is marked at the left, Fig. 98b.

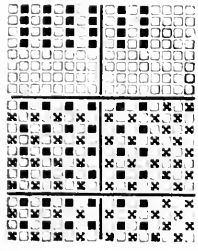


Fig. 98.

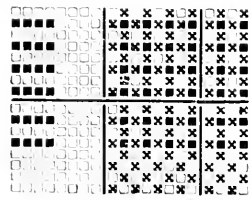


Fig. 98b.

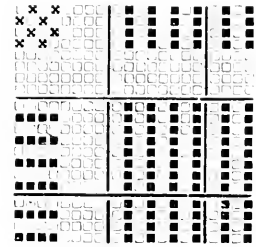


Fig. 98c.

The intersections at which the colored threads come to the face are here indicated on both Figs. 98 and 98b by (■). These are then transferred to another draft, Fig. 98c, which shows the color effect produced by the combination.

Figs. 99, 100, 101, 103, 104, 105, 106, 108, 109 and 110 show effects produced by a plain weave with different warp and filling patterns.

Fig. 102a is the cloth woven with Fig. 102.

Where more than three colors are used the third color is indicated by (◫). The weave is shown at the upper left hand corner. The color effects only are marked on the body of the draft. A change of the color from the odd to the even threads reverses the direction of the color line, Fig. 106.

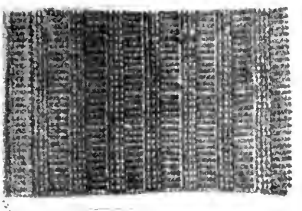


Fig. 102a.

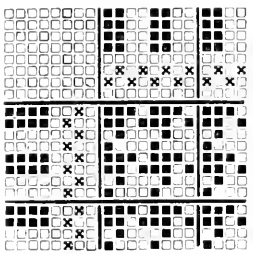


Fig. 99.

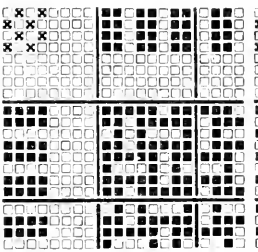


Fig. 100.

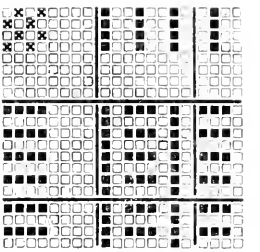


Fig. 101.

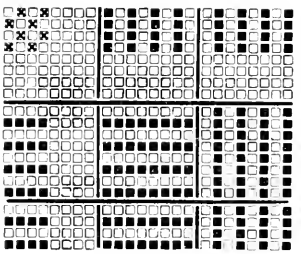


Fig. 102.

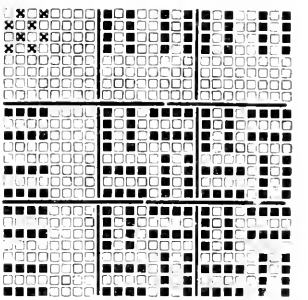


Fig. 104.

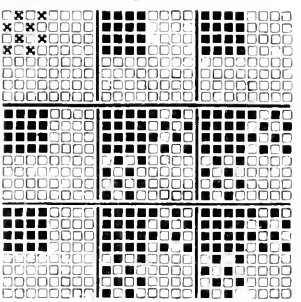


Fig. 103.

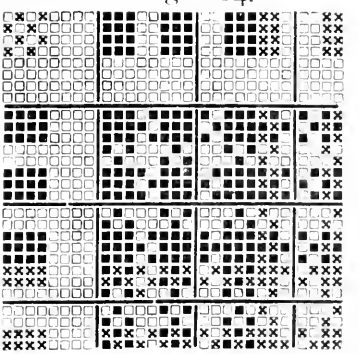


Fig. 105.

Figs. 106a and 107a are samples of cloth corresponding to Figs. 106 and 107 respectively.

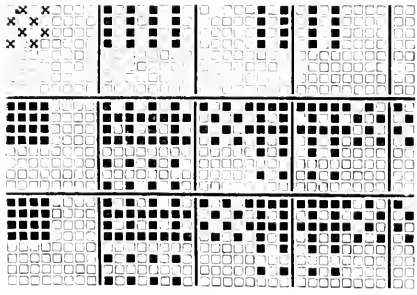


Fig. 106.

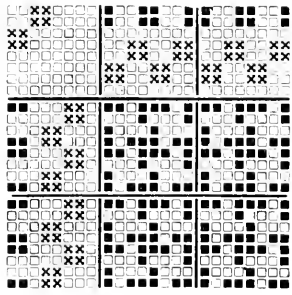


Fig. 107.

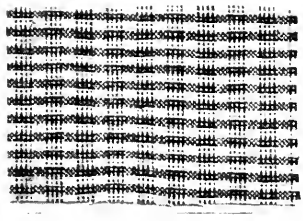


Fig. 106a.

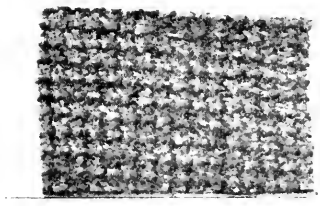


Fig. 107a.

To have the warp and filling colors balance and produce a perfect pattern, the warp and filling yarn should be of the same size and shade and be set with the same number of threads per inch.

Figs. 107, 111 and 112 show color effects produced by the combination of a basket weave with various warp and filling patterns.

Fig. 113 is a broken weave, Fig. 114 a cross rib, Fig. 115 a long rib, in which color effects are produced by various warp and filling patterns.

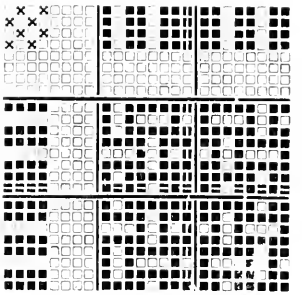


Fig. 108.

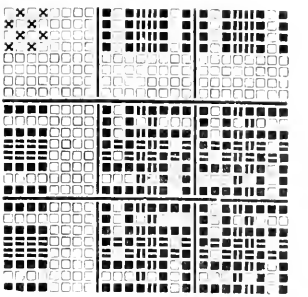


Fig. 109.

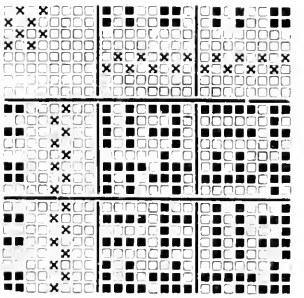


Fig. 110.

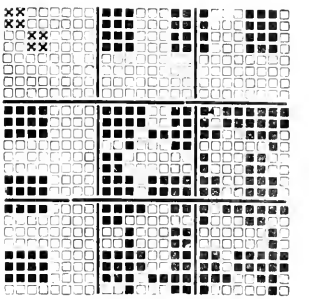


Fig. 111.

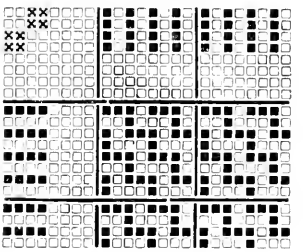


Fig. 112.

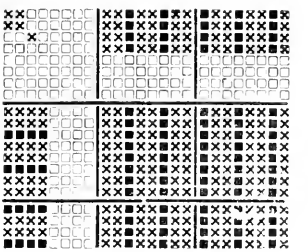


Fig. 113.

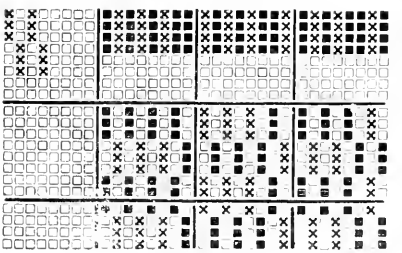


Fig. 114.

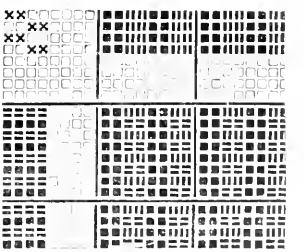


Fig. 115.

COLOR EFFECTS BY TRANSPOSING THE WEAVE.

Color effects can be produced by transposing a plain weave and keeping the warp and filling colors unchanged.

Fig. 116 is the motive for a design on a plain weave, woven one dark thread and one light thread in both warp and filling. This motive is transferred to a draft covering the threads in the pattern, Fig. 116a.

A plain weave beginning with the first warp thread up is then filled in on the blank squares, and a plain weave beginning with the first warp thread down is next filled in on the black squares, see Fig. 116b.

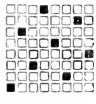


Fig. 116.

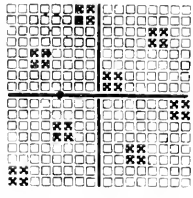


Fig. 116a.

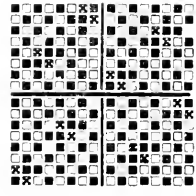


Fig. 116b.

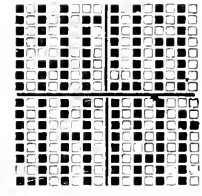


Fig. 116c.

Fig. 116c shows the color effects produced. In this way a great variety of effects can be obtained.

Care must be taken to have the same number of threads per inch in both warp and filling. If there is any difference, the warp should be set slightly closer, that the pattern may be slightly elongated rather than flat. This rule applies to nearly all weaves, patterns and fabrics.

Fig. 117 is the motive for another color effect produced in this way. Fig. 117a is the motive transferred to the draft. Fig. 117b is the motive and weave combined. Fig. 117c shows the color effect produced.

Fig. 118 is the motive; Fig. 118a is the motive and weave transferred to the same draft. Fig. 118b is the cloth so woven. See following pages.

Fig. 119 is a motive; Fig. 119b. the motive and a basket weave combined; Fig. 119c the color effect pro-

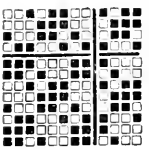


Fig 117

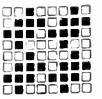


Fig. 118.

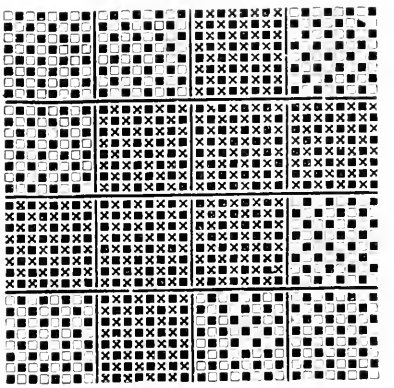


Fig. 118a.

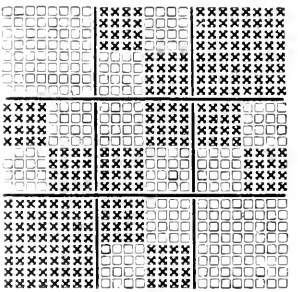


Fig. 117a.

Fig. 119.

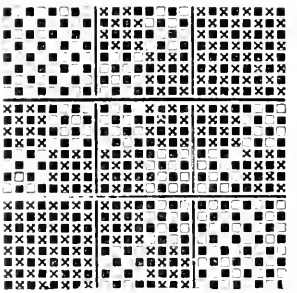


Fig 117b.

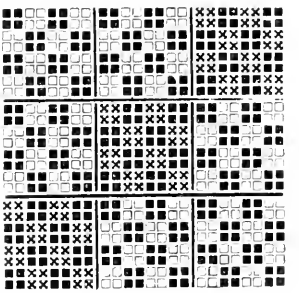


Fig. 119b.

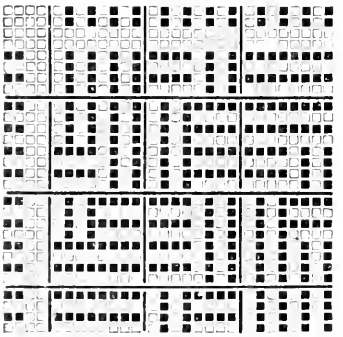


Fig. 117c.

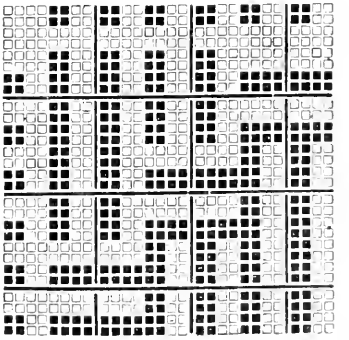


Fig. 119c.

duced by thus transposing a four leaf basket weave. The pattern must, as a matter of course, be two light, two dark threads, instead of one dark, one light thread, as with the plain weave.

TWILLS.

If the warp and filling are so interlaced that the floats are grouped in diagonal lines, the weave is called a twill and exhibits more or less sharply defined ridges or lines made by the warp as well as the filling.

The angle of a twill is that formed by the filling and the twill line; thus, Fig. 120-1 has an angle of 27°; Fig. 120-2, 45°; 120-3, 63°. Twills having an angle of 45° are called normal, Fig. 120-2; under 45°, flat, Fig. 120-1; over 45°, steep twills, Figs. 121 and 122.

The twist of the warp and filling yarn has a great influence on the appearance of the twill. The same twist in both warp and filling makes the twill sharper and more distinct than when the warp twist is opposite to that of the filling. Warp and filling of different twists are used principally for woolen fabrics especially those on which a smooth face is desired, such as face goods.

Fig. 123 shows a thread twisted to the right; Fig. 124 to the left.

Fig. 125 shows a twill running to the right and made with both warp and filling twisted to the right, making the twist effect more distinct than in the twill shown at Fig. 126 in which the warp is twisted to the right and the filling to the left.

To make the twill effect more pronounced the twill should run with the twist of the yarn.

If the filling floats on the face more than the warp in a twill weave the weave is called a filling twill, Fig. 127. If the warp floats more on the face the weave is called a warp twill, Fig. 128.

Where the float of the warp is equal to that of the filling the weave is called a balanced twill, Fig. 129.

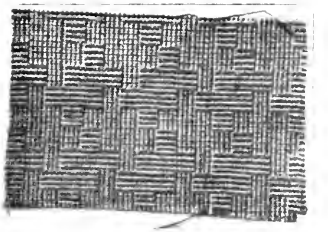


Fig. 118b.

TWILLS.

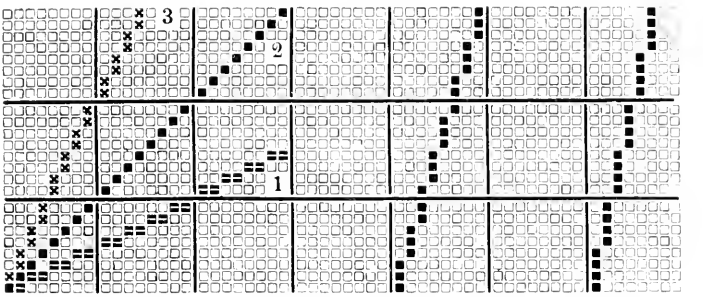
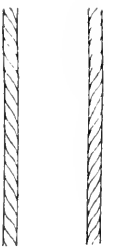
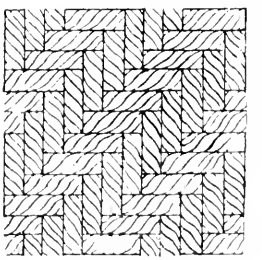


Fig. 120. Fig 121. Fig. 122.





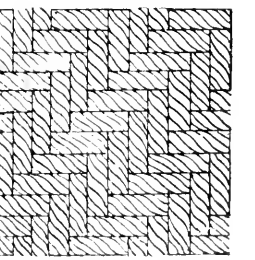
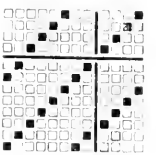
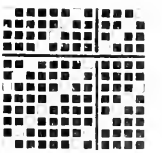


Fig 123. Fig 124. Fig 125. Fig. 126.





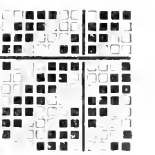


Fig. 127. Fig. 128. Fig. 129.

NORMAL TWILLS.

In these the float of each successive filling thread is set one thread either to the right or left of the float of the preceding thread. The simplest form is the 3-leaf twill.

Fig. 130 is the 3-leaf filling; Fig. 131, the 3-leaf warp twill.

Fig. 132 is a 4-leaf filling; Fig. 133, a 4-leaf warp twill. Fig. 134 is a cross section of a cloth woven with the twill at Fig. 132.

Fig. 135 is a 4-leaf balanced twill called in the woolen and worsted industry a cassimere twill, in the silk industry a Batavia twill.

Fig. 136 is a cross section of a cloth woven with a cassimere twill.

Twills are designated by the number of shafts or harnesses required for weaving them; thus, Figs. 137 and 138 are 5-leaf filling twills; Figs. 139 and 140 are 5-leaf warp twills; Fig. 141, an 8-leaf balanced twill; Fig. 142, a 6-leaf balanced twill; Fig. 143, an 8-leaf fancy filling twill.

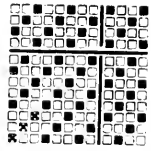


Fig. 130.

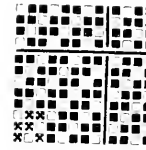


Fig. 131

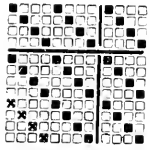


Fig 132.

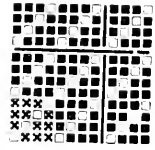


Fig 133

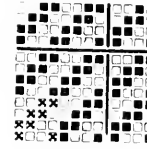


Fig. 135.

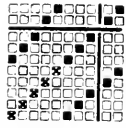


Fig. 137

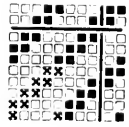


Fig. 138.

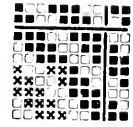


Fig. 139.

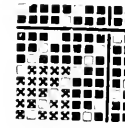


Fig 140.

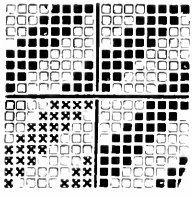


Fig. 141.

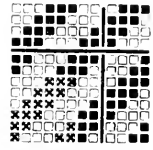


Fig. 142.

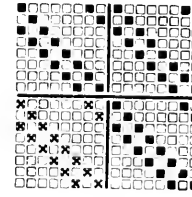


Fig. 143.

Fig. 134.

Fig. 136.

STEEP TWILLS.

If more than one pick is woven in each shed of a 45° twill, a steep twill, having an angle greater than 45° is formed. The angle of the twill increases with the number of picks in a shed.

Twills with two picks in a shed, Figs. 144 to 150, cover twice as many filling as warp threads; with three picks in a shed, Fig. 152, three times as many; with four picks in a shed, Fig. 153, four times as many, etc.

There are steep twills, however, that cover the same number of threads in warp and filling, Fig. 151.

They are formed by first deciding upon the number of picks in the filling pattern and then laying out the weave so that the same number of warp threads will include two or more twills as desired. Such twills have an odd number of threads in warp and filling patterns.

Steep twills can also be made by setting the warp closer than the filling.

FLAT TWILLS.

These are steep twills reversed, the warp draft being used for filling and the filling for warp, Figs. 154 to 159.

Flat twills may have two, three or four times as many warp as filling threads in the pattern, depending on the angle of the twill; or the warp and filling patterns may each cover the same number of threads which in such cases is an odd number, Figs. 155, 158 and 159.

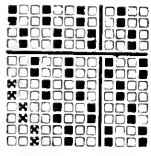


Fig. 144.

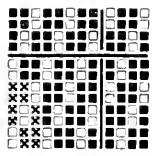


Fig. 145.

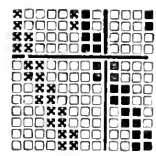


Fig. 146.

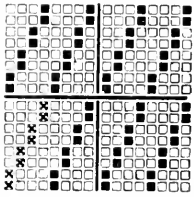


Fig. 147.

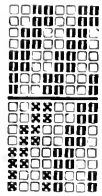


Fig. 148.

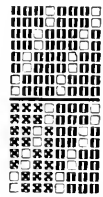


Fig. 149.

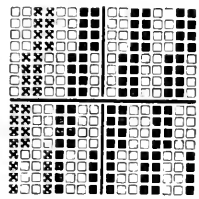


Fig. 153.

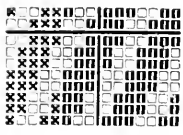


Fig. 150.

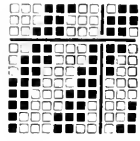


Fig. 151.

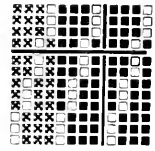


Fig. 152.

FLAT TWILLS.

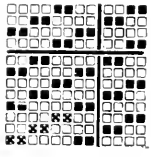


Fig. 154.

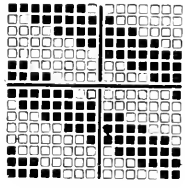


Fig. 155.

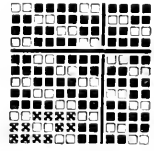


Fig. 156.

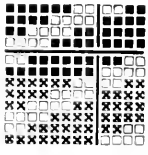


Fig. 157.

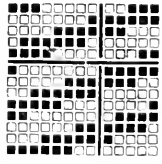


Fig. 158.

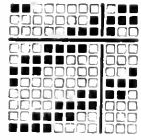


Fig. 159.

STITCHED TWILLS.

Twills with a very long float in warp or filling make a fabric soft and spongy. To correct this defect the floats are stitched down, in such a way, however, that the general character of the twill is not changed, Figs. 160 to 175.

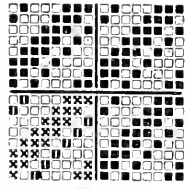


Fig. 160.

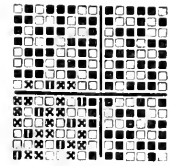


Fig. 161.

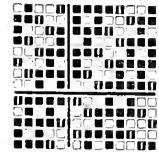


Fig. 162.

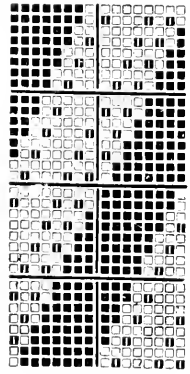


Fig. 163.

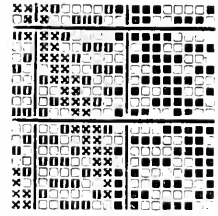


Fig. 164.

In these drafts the stitches where the warp is raised are indicated by (=) or (‖). These stitches are either scattered over the warp or filling twill so as not to make a continuous line, Figs. 161 to 166, 169 to 175, or they are arranged in faint twill lines, Figs. 160, 167 and 168.

Figs. 161a and 163a are cloths woven with Figs. 161 and 163 respectively. The angle of the twill at Fig. 163a is modified by setting the filling closer than the warp.

The set of the fabric depends somewhat on the frequency of the stitchers. The tighter the twill is stitched the more open must be the set.

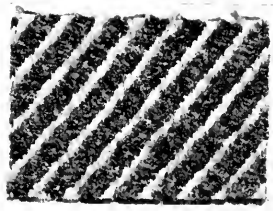


Fig. 161a.

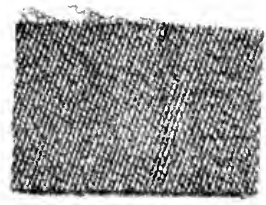


Fig. 163a.

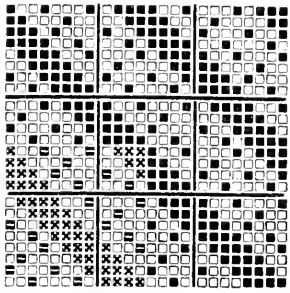


Fig. 165.

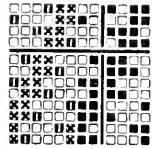


Fig. 166.

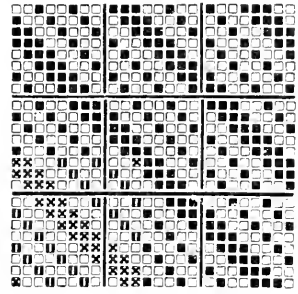


Fig. 167.

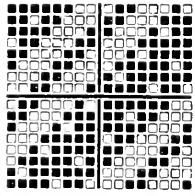


Fig. 168.

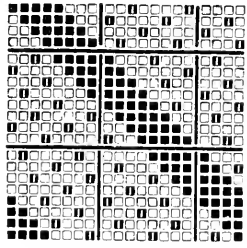


Fig. 169.

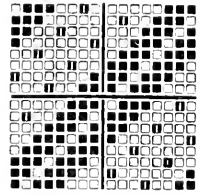


Fig. 170.

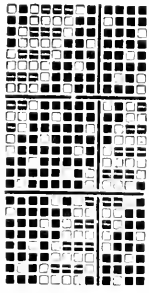


Fig. 174

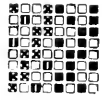


Fig. 171.

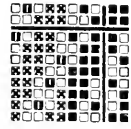


Fig. 172.

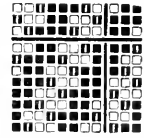


Fig. 173.

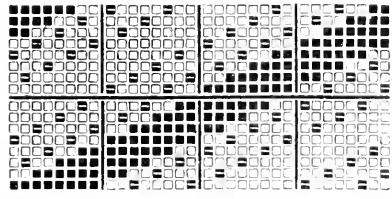


Fig. 175.

FANCY TWILLS.

Regular and stitched twills each give the goods a smooth appearance. To diversify the effect other weaves are combined with the principal twill, but made subordinate to it.

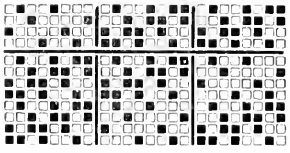


Fig. 176.

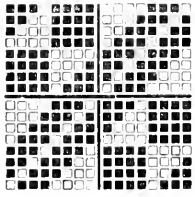


Fig. 177.

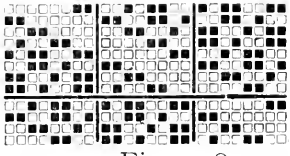


Fig. 178.

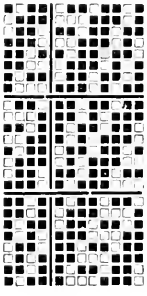


Fig. 179.

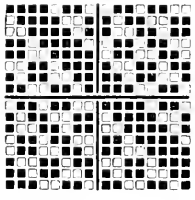


Fig. 180.

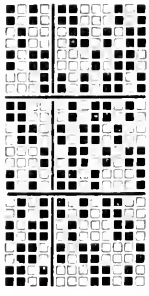


Fig. 181.

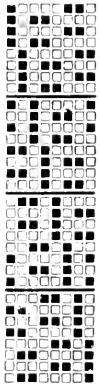


Fig. 182.

In drafting fancy twills the main twill is first formed over the given number of threads in the pattern. The subordinate weaves are then worked in so as to join neatly with the twill, very long floats being avoided. Figs. 176 to 191 are examples of fancy twills.

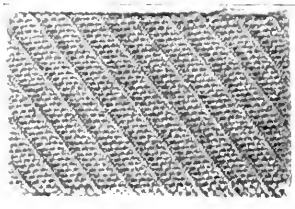


Fig. 185a.

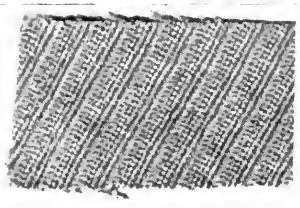


Fig. 188a.

Shaded twills, which are also classed as fancy twills, are shown at Figs. 187, 188 and 190.

Figs. 185a and 188a are cloths woven with Figs. 185 and 188.

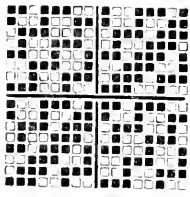


Fig. 183.

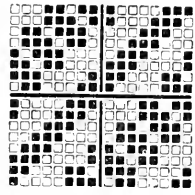


Fig. 184

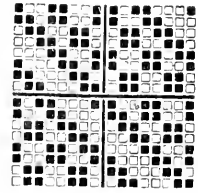


Fig. 185.

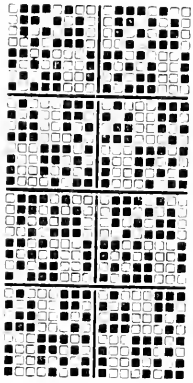


Fig. 186.

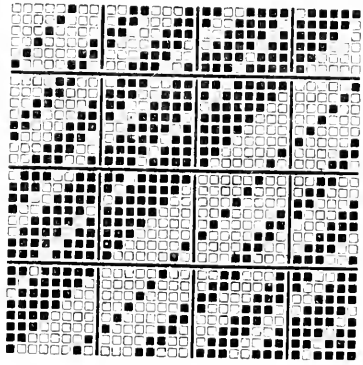


Fig. 187.

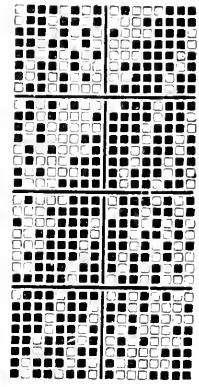


Fig. 188.

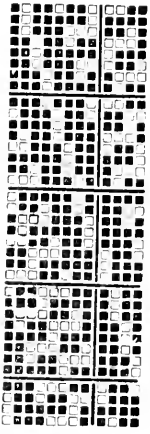


Fig. 189.

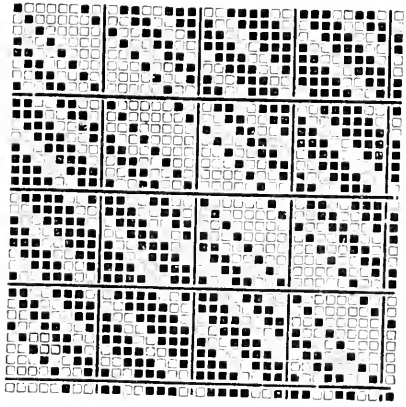


Fig. 190.

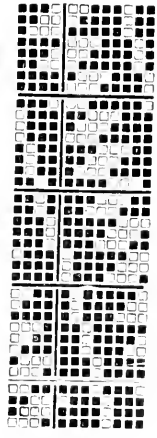


Fig. 191.

COMBINATION TWILLS

These twills are shown at Figs. 192 to 198, and are formed by combining with the principal twill another one, which either runs parallel with the main twill or intersects it at a more or less acute angle.

The two twills must be joined so as to avoid causing a long float that would destroy the effect of either.

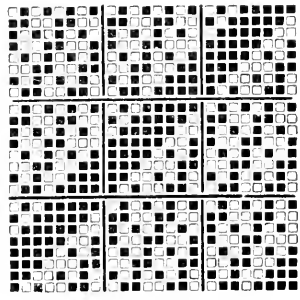


Fig. 192.

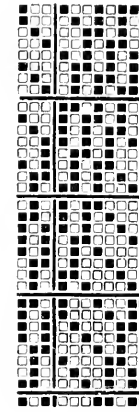


Fig. 193.

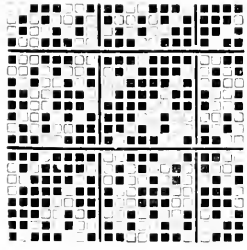


Fig. 194.

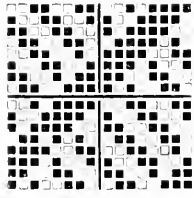


Fig. 195.

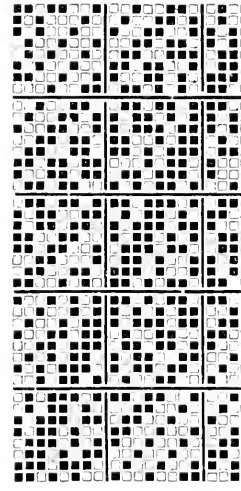


Fig. 196.

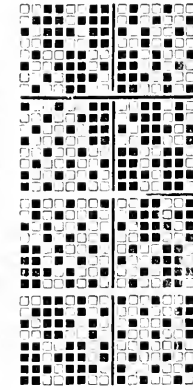


Fig. 197.

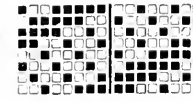


Fig. 198.

RIB TWILLS.

With fancy twills are classed the so-called rib twills, which are made by combining twills with either warp or filling ribs.

The same care must be taken in joining the different weaves, Figs. 199 to 204, as is necessary in drafting the combination twills already described.

The twill effect can be made very distinct by having the color of the warp in strong contrast with that of the filling.

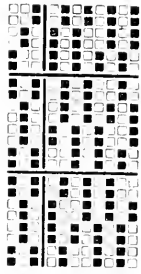


Fig. 199.

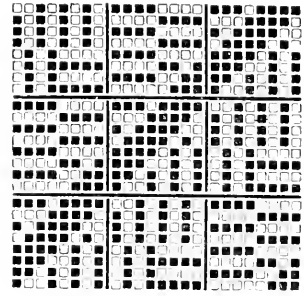


Fig. 200.

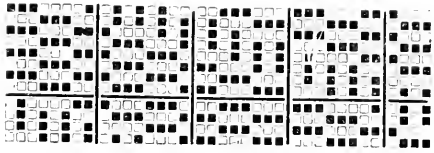


Fig. 201.

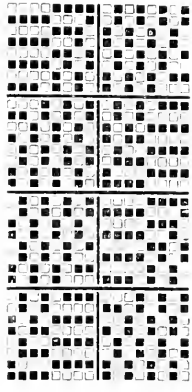


Fig. 202.

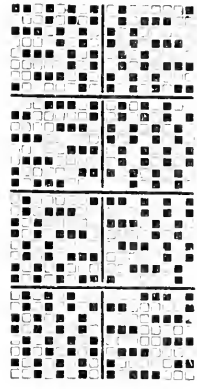


Fig. 203.

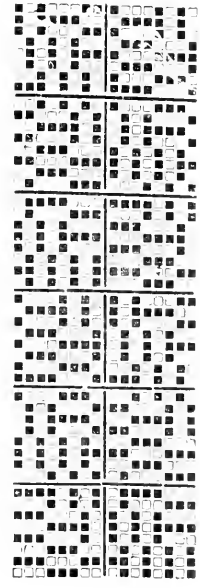


Fig. 204.

FANCY TWILLS DERIVED FROM FILLING TWILLS.

Filling twills are used as a ground work in the production of many beautiful twill effects of peculiar appearance.

A filling twill is used for the ground weave and risers are then inserted to produce the effect desired.

Figs. 205 to 214 show several examples of these weaves, the foundation filling twill being indicated by (×). Fig. 212 gives a shaded effect: Fig. 214, the effect of scales on a fish.

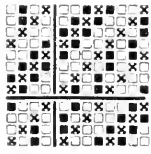


Fig. 205.

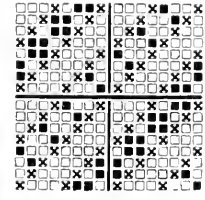


Fig. 206.

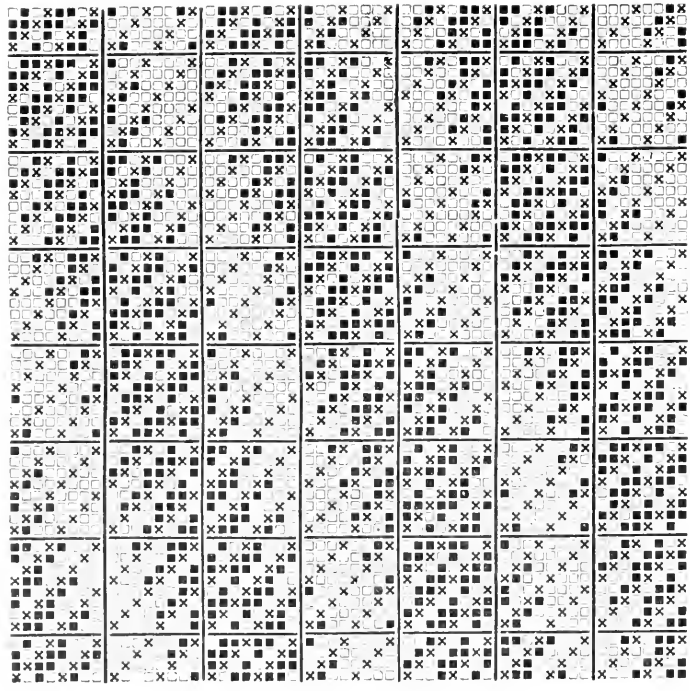


Fig. 207.

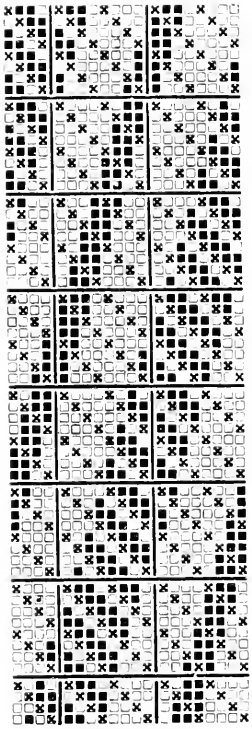


Fig. 210.

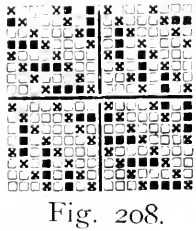


Fig. 208.

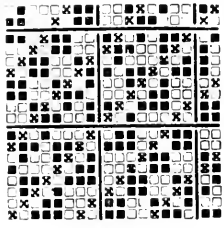


Fig. 209.

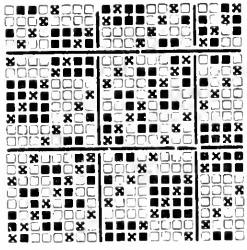


Fig. 211.

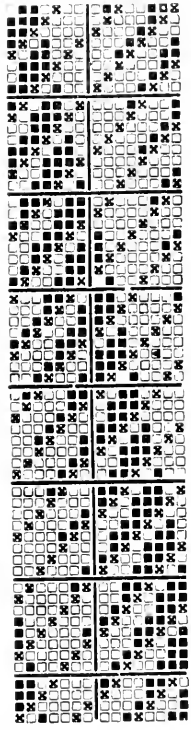


Fig. 212.

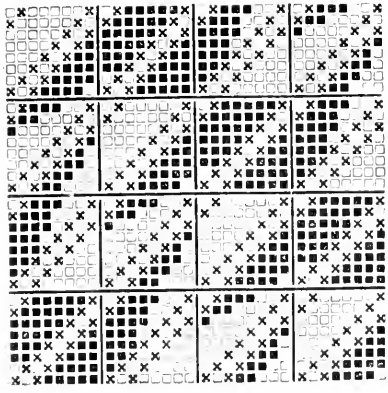


Fig. 213.

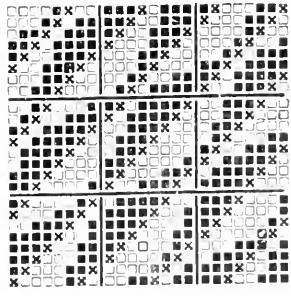


Fig. 214.

DEFLECTED, UNDULATING AND CURVED TWILLS.

Whenever the direction of a twill is changed a broken place occurs. If the twill line is broken frequently enough to change its general direction, a curved twill line is formed which is converted into an undulating line by combining small and large breaks in the proper order.

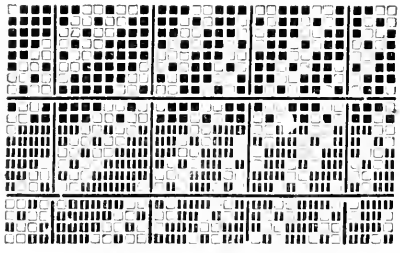


Fig. 215.

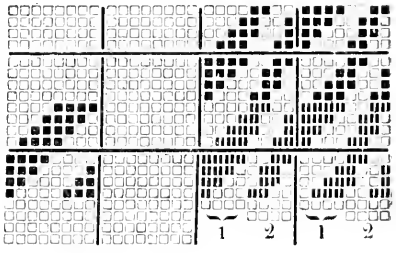


Fig. 216a Fig. 216.

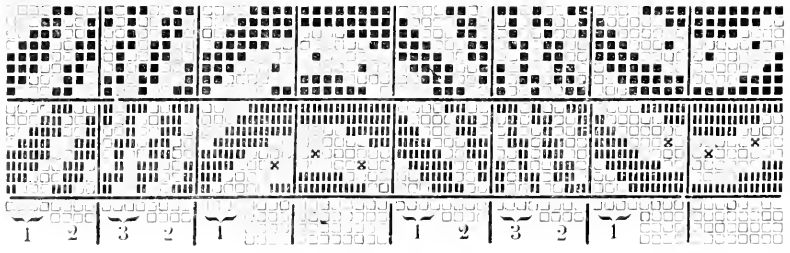


Fig. 217.

Figs. 215, 219 and 220 are deflected twills.

Fig. 219a is the cloth made with Fig. 219.

Figs. 216, 218 and 221 are undulating twills.

Figs. 217 and 222 are curved twills.

Fig. 222a is the ground weave of Fig. 222.

Fig. 216a is the foundation twill for the undulating twill, Fig. 216.

The threads enclosed in brackets are woven in unbroken order and between each of these and the adjacent group is found a break in the twill. The number indicates the angle of the twill line; No. 1, 45°, etc.

Each weave is indicated separately by (II).

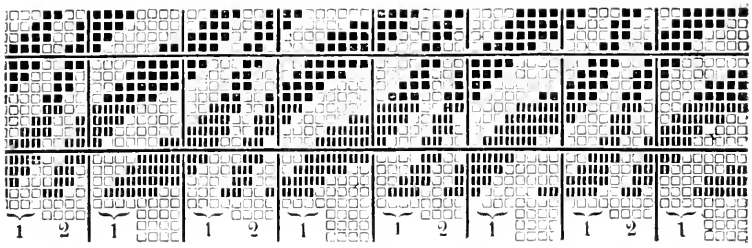


Fig. 218

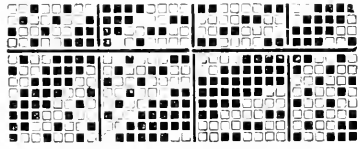


Fig. 219.

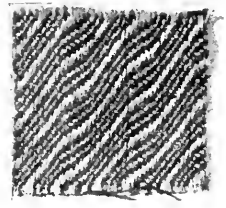


Fig. 219a.

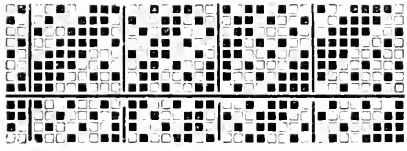


Fig 220.

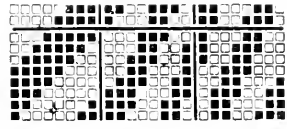


Fig. 221.

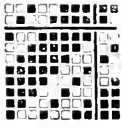


Fig. 222a

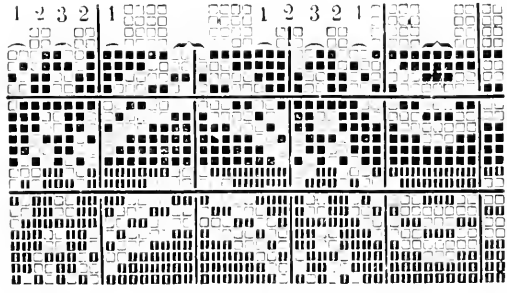


Fig. 222.

BROKEN TWILLS.

These are formed by breaking the twill so that a filling takes the place of a warp twill and a warp the place of a filling twill.

Broken twills are distinguished from deflected twills by having the warp and filling twills transposed instead of having the twill line merely deflected. This transposition is repeated at intervals until the pattern is completed.

The twill line can be broken in the same weave in the direction of both warp and filling, examples of which are shown at Figs. 224, 232, 233 and 233x.

To avoid having too many threads in the pattern, a difficulty that is very apt to arise with these weaves, the ground weave and one thread more are used. Fig. 233 is an example in which the break occurs every 11 threads and the ground weave covers 10 threads.

Figs. 223, 225, 226, 227, 228 and 229 are weaves with the twill broken in the direction of the warp.

Fig. 223a is the cloth woven with Fig. 223.

Figs. 230 and 231 have the twill broken in the direction of the filling.

Figs. 224, 232, 233 and 233x have the line broken in both directions.

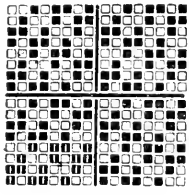


Fig. 223.

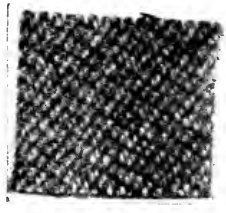


Fig. 223a.

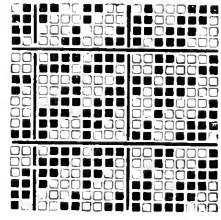


Fig. 224.

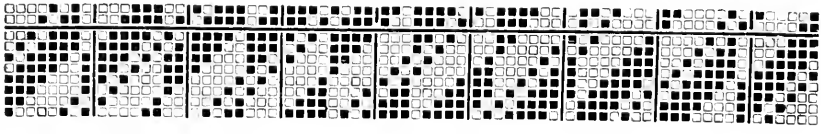


Fig. 225.

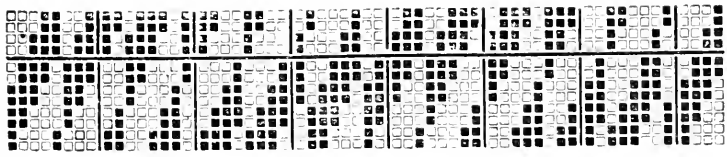


Fig. 226.

Fig. 227.

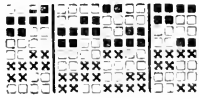


Fig. 228.

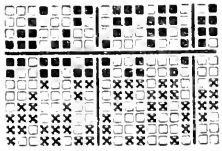


Fig. 229

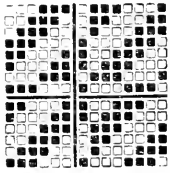
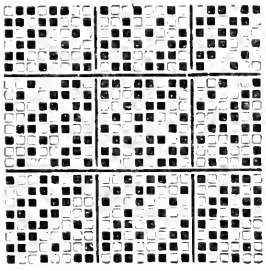


Fig. 230.

Fig 232.

Fig. 231.



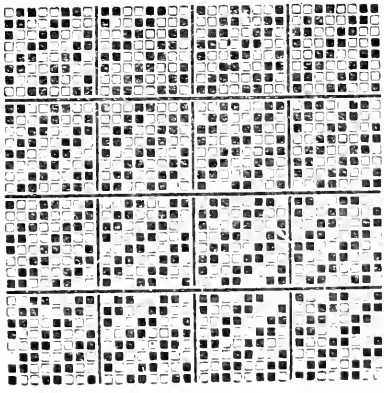


Fig. 233.

Fig. 233x

DOVETAIL TWILLS.

By dovetailing a twill with itself or with a different twill, an indefinite number of twills can be made. This dovetailing is effected by alternating one or more threads of one weave with one or more threads of another weave. By varying the point of commencement a new twill is obtained.

By such combinations wide diagonal effects can be obtained with a small number of shafts.

Figs. 234, 237 and 239 show twills obtained by dovetailing a twill with itself.

Fig. 234 is the ground twill. Figs. 234a, 234b and 234c are twills obtained by beginning the union at different points.

Fig. 234.

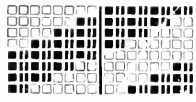


Fig. 234a

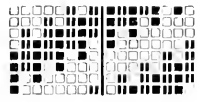


Fig. 234b

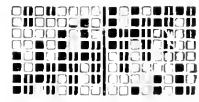


Fig. 234c

Fig. 235.

Fig. 235a

Fig. 235b

Fig. 236a

Fig. 236b

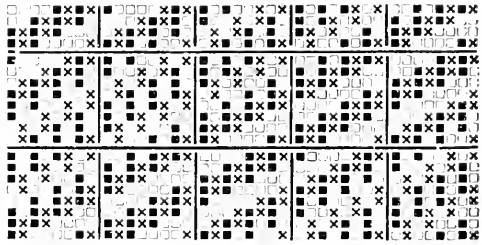


Fig. 236.

Fig. 237 is the ground twill. Figs. 237a, 237b and 237c are dovetailed twills obtained from it.

Fig. 239 is a ground twill. Figs. 239a, 239b and 239c are resulting dovetail twills.

Fig. 238 is a twill obtained by dovetailing two different twills, Figs. 238a and 238b, together.

The separate twills are indicated in these weaves by either (ll) or (×).

Two normal twills dovetailed result in a flat twill; on the other hand, a normal twill results from the dovetailing of two 63° twills, Figs. 235a and 235b from Fig. 235.

If two 45° twills are dovetailed in the direction of the filling a 63° twill results.

Figs. 236 and 240 are examples of dovetailing twills in which each has a different number of shafts. Fig. 236 from Figs. 236a and 236b. Fig. 240c from Figs. 240a and 240b.

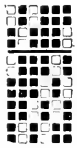


Fig. 237.

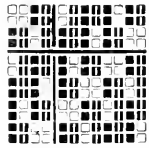


Fig. 237a

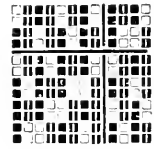


Fig. 237b

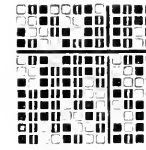


Fig. 237c

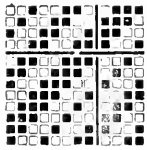


Fig. 238a

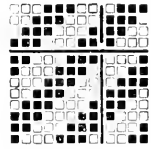


Fig. 238b

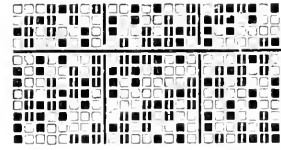


Fig. 238.

Fig. 239.

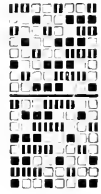


Fig. 239a

Fig. 239b

Fig. 239c

Fig. 240a

Fig. 240b

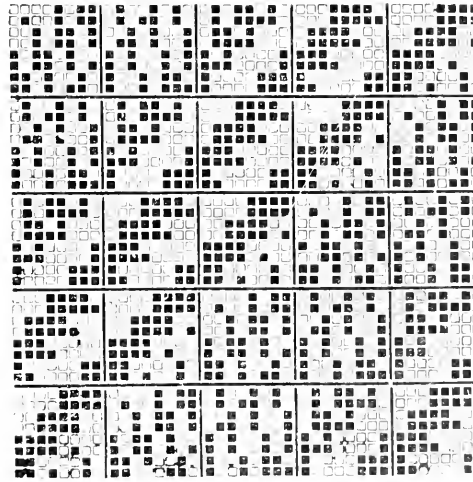


Fig. 240c

CROSS AND ZIGZAG TWILLS.

Cross and zigzag twills are derived from regular twills. The first named shows the figures of a cross, the second a zigzag line. A cross twill is obtained when the twill runs a certain distance in one direction and then without joining runs in the opposite direction.

If the distance over which the twill runs in one direction is made too long, the cross form is lost and a stripe effect obtained. To obtain the cross effect the threads in the pattern are divided into four equal parts, Figs. 241 and 243.

In part 1 the twill line runs to the right; in part 3 to the left, Figs. 242 and 244.

By inserting more or less warp risers in these cross twill weaves, we obtain warp twills, Figs. 247 and 251; balanced twills, Figs. 246 and 250; stitched twills, Fig. 253; or fancy twills, Figs. 252 and 254.

Fig. 241.

Fig. 242.

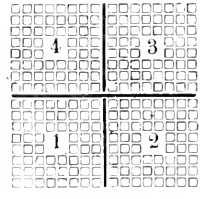


Fig. 243.

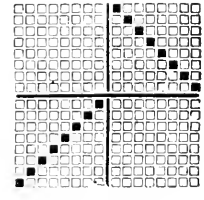


Fig. 244.

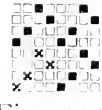


Fig. 245.

Fig. 246.

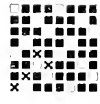


Fig. 247.

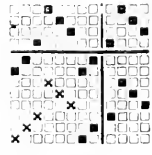


Fig. 248.

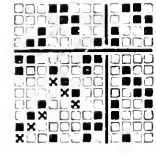


Fig. 249

Cross twills are also classed as filling twills, Figs. 245, 248 and 249: warp twills, Fig. 247; balanced twills, Fig. 246.

Zigzag twills are obtained by uniting two twills running in opposite directions in such a way as to form a point without a break.

According to the general direction of the zigzag line, they are distinguished as cross zigzag, Fig. 255; long zigzag, Fig. 256, and diagonal zigzag, Fig. 257.

The last named form is obtained when the twill runs in one direction farther than in the other.

These zigzag twills are also divided into warp twills, Fig. 260; filling twills, Figs. 258 and 259; balanced twills, Figs. 261 and 264; stitched twills, Fig. 263; fancy twills, Fig. 262.

Fig. 255.

Fig. 256.

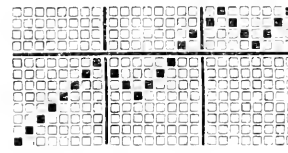


Fig. 257.

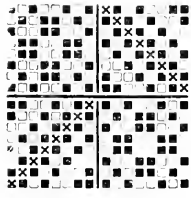


Fig. 252

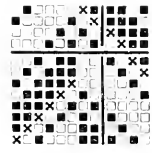


Fig. 253.

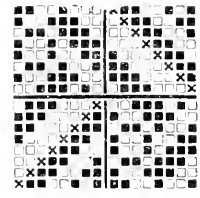


Fig. 254.

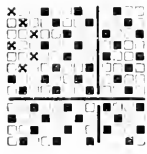


Fig. 258.

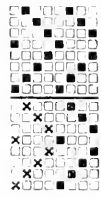


Fig. 259.

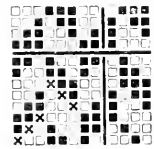


Fig. 250.

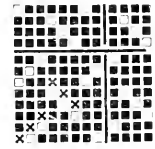


Fig. 251.

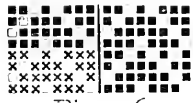


Fig. 260.

Fig. 261.

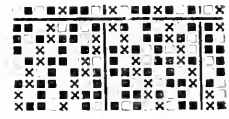


Fig. 262.

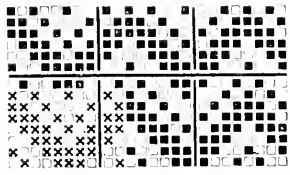


Fig. 263.

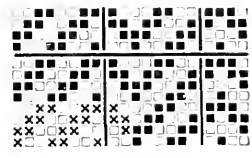


Fig. 264.

EFFECTS BY CHANGING POSITION OF COLORS.

As with plain weaves, color effects can be produced by changing the position of the colored threads in the warp and filling. For stripes, warp weaves are generally used since these produce clear effects.

With filling weaves clear cross lines are produced by the proper arrangement of colors in warp and filling.

Figs. 265 and 266 show color effects with a warp twill; Fig. 267, with a filling twill; Figs. 268, 269, 270 and 271, different arrangements of colors with a 4-leaf balanced twill; Figs. 268a, 269a and 271a are fabrics woven with Figs. 268, 269 and 271 respectively; Figs. 272 and 273, with a broken 4-leaf warp twill; Fig. 274, with a broken 4-leaf balanced twill; Fig. 275, with a 6-leaf balanced twill; Fig. 276, with a stitched twill; and Fig. 277, with a broken diagonal weave.

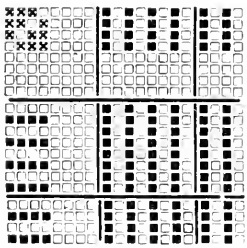


Fig. 265.

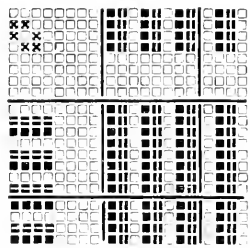


Fig. 266.

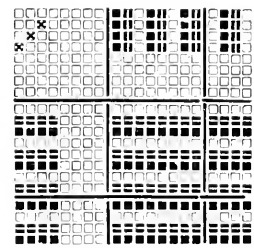


Fig. 267.

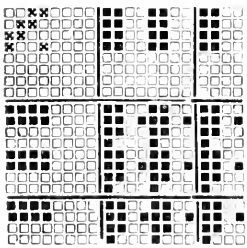


Fig. 268.

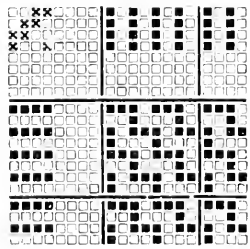


Fig. 269.

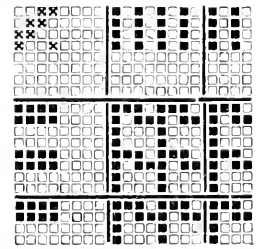


Fig. 270.

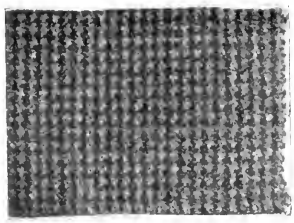


Fig. 268a.

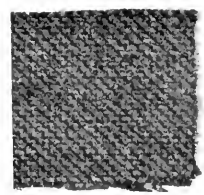


Fig. 269a.

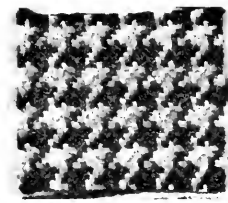


Fig. 271a.

The arrangement of colors for the warp is indicated at the top, and for the filling at the left hand side of the draft; the weave is shown at the upper left hand corner.

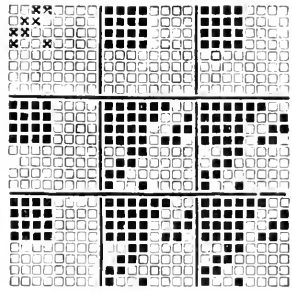


Fig. 271.

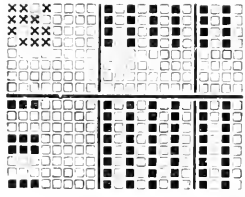


Fig. 272.

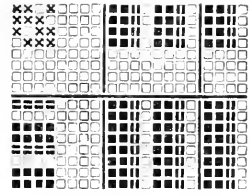


Fig. 273.

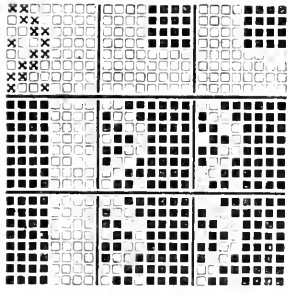


Fig. 274.

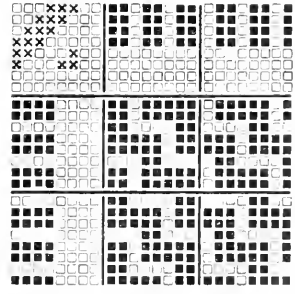


Fig. 275.

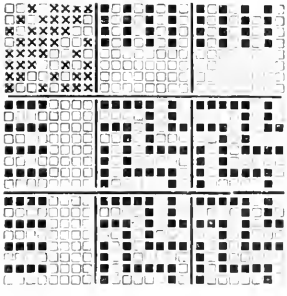


Fig. 276.

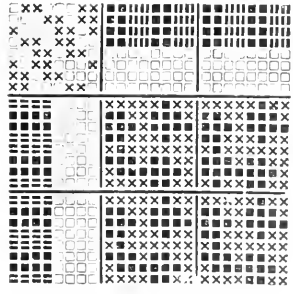


Fig. 277.

COLOR EFFECTS BY TRANSPOSING TWILL WEAVES.

Color effects in both warp and filling can also be produced by transposing twill weaves. After long and cross stripes have been produced by suitable combinations of warp and filling with twill weaves, it is not difficult to obtain combinations of long and cross stripes by combining warp and filling weaves.

The method is as follows: The figure that is to be brought out by the combination of long and cross stripes is painted on design paper; this facilitates the drafting of the weave. This color effect is shown in Fig. 278 by (×).

In this draft one square may represent 1 or more warp and filling threads.

On the colored surface the 3-leaf warp twill is now drafted and the remaining surface is covered with the 3-leaf filling twill, either straight or broken, Fig. 278a. The filling twill will give the reverse effect of the warp twill

(*Continued on page 60.*)

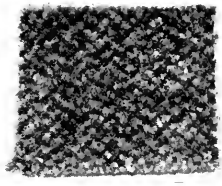


Fig. 246a.

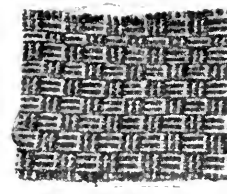


Fig. 278c.

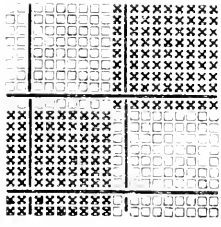


Fig. 278.

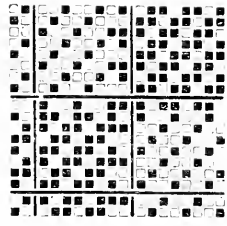


Fig 278a

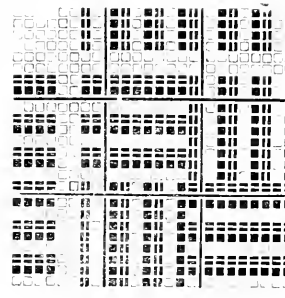


Fig. 278b

The warp and filling pattern is either one light and two dark, or two light and one dark, or three colored.

This arrangement of colors gives long stripes on a warp weave and cross stripes on a filling weave.

Fig. 278b shows the color effect obtained with 278a; the warp and filling patterns are indicated respectively at the top and left hand side of the draft. Another example of this color effect is shown at Fig. 279, in which 279 is the motive, 279a the two weaves combined, and 279b the color effect. Fig. 278c is the cloth woven with Fig. 278.

More than three shafts are seldom used, as the textures thus produced are not smooth.

Figs. 280a and 280b show an effect produced by transposing a 4-leaf twill.

Stitched twills can also be used for these effects. See Figs. 281, 282 and 282a.

Fig. 279.

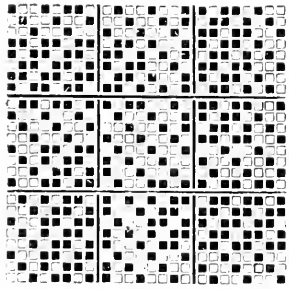


Fig. 279a

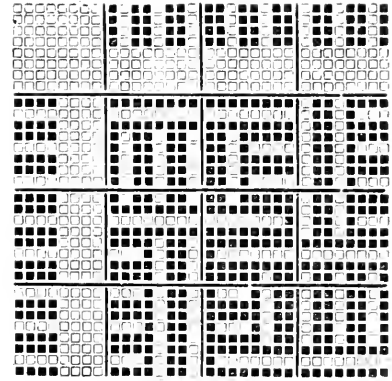


Fig. 279b

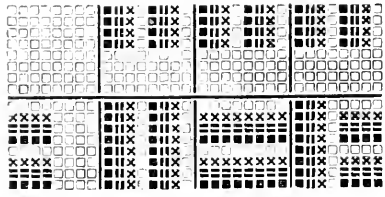


Fig. 280b

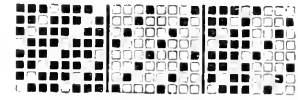


Fig. 280a

Fig. 282.

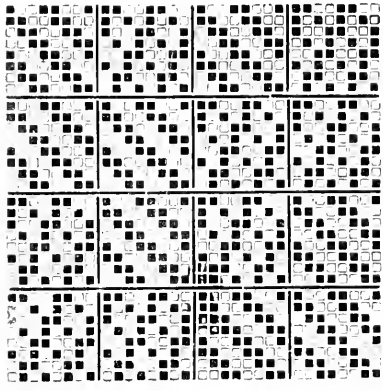


Fig. 281

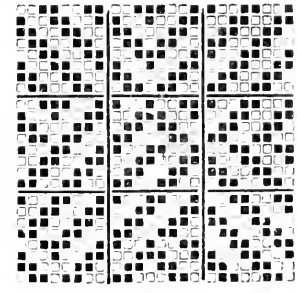


Fig. 282 a

SATIN WEAVES.

Satin and doeskin weaves give a fabric with a smooth lustrous face.

The twill is produced whenever a warp and filling thread stitched together lie adjacent to another pair of warp and filling threads also stitched together. In other words, whenever two risers lie diagonally adjacent to each other as in a 3-leaf twill, Fig. 130. If the intersections do not come on adjacent threads, a scattered interlacing of the threads is produced, called a satin weave, which gives the cloth a smooth appearance. The greater the regularity and the more the intersections are scattered, the smoother the cloth will be.

The luster comes partly from the character of the raw material and partly from the floating of the warp and filling for a greater distance.

Satin weaves are classified as regular, irregular, stitched and shaded.

The drafting of a filling satin weave is as follows:— The number of threads in the weave pattern is divided into two relatively prime numbers, that is, two numbers which are prime to each other, neither being equal to nor divisible by the other. For example, a 5-leaf satin is divided into 2 and 3, a 7-leaf into 3 and 4 or 2 and 5, an 8-leaf into 3 and 5, a 13-leaf into 2 and 11, 4 and 9, 3 and 10, 5 and 8, etc.

One of these is selected as the rising number and from each stitched thread an equal number of warp threads are counted to the right along the line of the filling; the last warp thread is stitched to the adjacent filling thread. The next filling thread is then stitched in

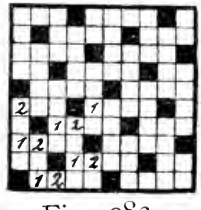


Fig. 283.

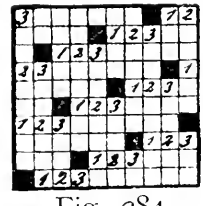


Fig. 284.

the same order and the process continued until all the warp and filling threads in the pattern have been stitched. Figs. 283 and 284 illustrate this process.

Fig. 283 is a 5-leaf satin divided into 3 and 2, 2 being used for the rising number. The reverse of a filling satin gives a warp satin weave. To prevent rolling, the selvage on satin weaves must be woven with plain weave or filling rib.

Fig. 285 is a 7-leaf satin in which 2 is used for the rising number.

Fig. 286 is an 8-leaf satin in which 5 is used for the rising number; Fig. 286a, the same with 3 as the riser.

Figs. 287 and 288 are 13-leaf satin weaves, the first having 3 and the last 4, for the rising number.

Fig. 289 is a 15-leaf satin with 4 for the riser.

Figs. 290, 291 and 292 are examples of warp satin weaves.

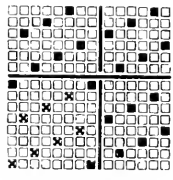


Fig. 285.

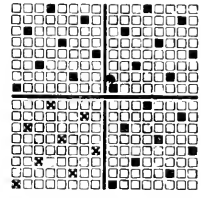


Fig. 286.

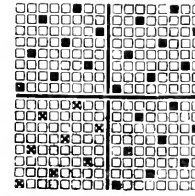


Fig. 286a

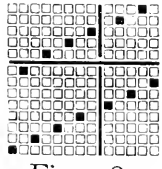


Fig. 287.

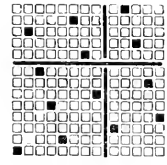


Fig. 288.

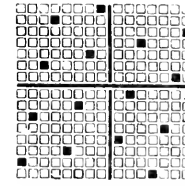


Fig. 289.

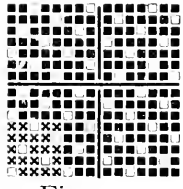


Fig. 290.

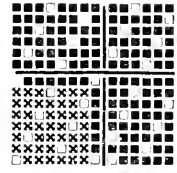


Fig. 291.

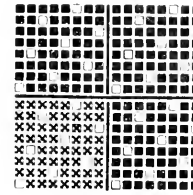


Fig. 292.

SATIN WEAVES WITH TWO OR MORE RISING NUMBERS.

Satin weaves with several rising numbers are also made according to fixed rules and the procedure is as follows:—The number of threads in the weave pattern is divided into two relatively prime numbers and these again divided into two or more parts which are used for risers as in regular satin weaves.

In this way the warp pattern is increased 2, 3 or more fold, according as 2, 3 or more rising numbers are used. The filling pattern remains unchanged.

For example, Fig. 293, a 10-leaf satin, is first divided into 3 and 7, the 7 again divided into 3 and 4, which are used for rising numbers and alternate with each other.

Fig. 294 is a 30-leaf satin in which 2 used twice alternates with 3 used once.

Figs. 295, 296 and 297 are filling satin, Figs. 298 and 299 warp satin weaves, each having more than two rising numbers.

IRREGULAR SATINS.

The stitching in satin weaves is sometimes arranged in irregular order to destroy the twill effect that is more or less visible in the regular satin. There is no rule for drafting irregular satin weaves.

Figs. 300, 301 and 302 are irregular satin weaves that are frequently used.

Figs. 300, 302 and 303 are irregular filling. Figs. 301 and 304 are irregular warp satins.

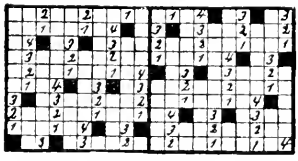


Fig. 293.

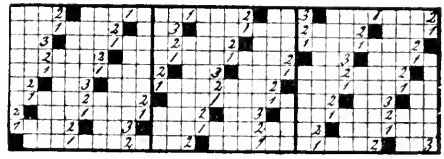


Fig. 294.

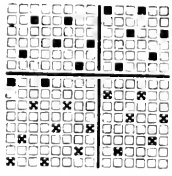


Fig. 295.

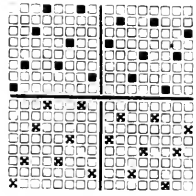


Fig. 296.

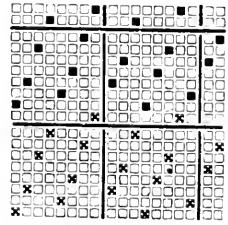


Fig. 297.

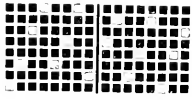


Fig. 298.

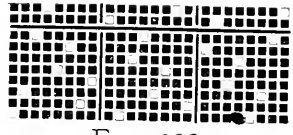


Fig. 299.

IRREGULAR SATINS.

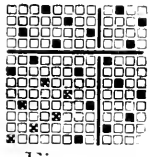


Fig. 300.

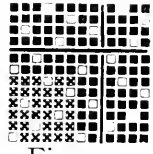


Fig. 301.

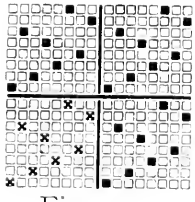


Fig. 302.

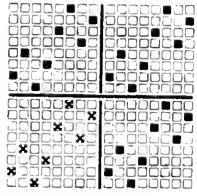


Fig. 303

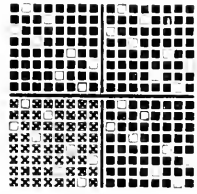


Fig. 304.

STITCHED SATINS.

The intersections of the warp and filling and consequently the firmness of the fabric decreases with the increase of the number of the threads in the pattern. For this reason satin weaves are generally drafted on a small number of shafts.

This difficulty with the larger satin weaves can be partially remedied by adding risers in the filling weaves and removing them in the warp weaves in such a way that the float of the threads will be shortened without destroying the general effect.

The farther this process is continued the more does the weave lose its satin character and assume either a twill, Fig. 309, rib or other form.

Shaded effects are produced by inserting risers at certain intervals in the satin weave. This shaded effect can be brought out very clearly by using contrasting colors for warp and filling. Figs. 318 and 320.

A 5-leaf satin with 2 picks in the shed is usually used

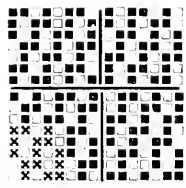


Fig. 305.

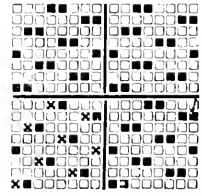


Fig. 306.

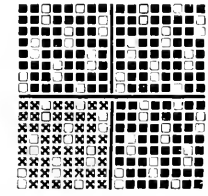


Fig. 307.

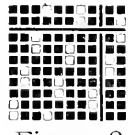


Fig. 308

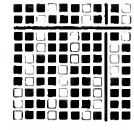


Fig. 309.

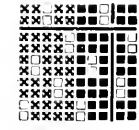


Fig. 310.

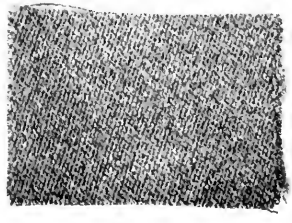


Fig. 305a.

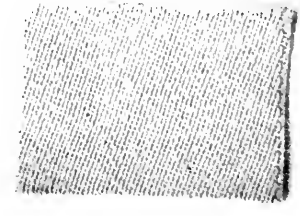


Fig. 308a.

in place of a 10-leaf stitched satin, Fig. 308. Various forms of stitched satin weaves are shown at Figs. 305 to 317.

Figs. 305a and 308a are fabrics woven with Figs. 305 and 308 respectively.

Figs. 318, 319 and 320 are shaded satins.

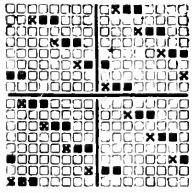


Fig. 311.

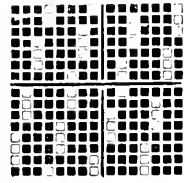


Fig. 312.

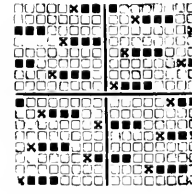


Fig. 313.

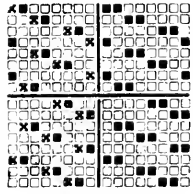


Fig. 314.

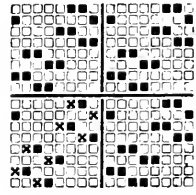


Fig. 315.

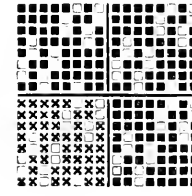


Fig. 316.

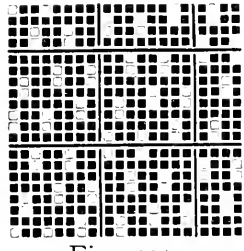
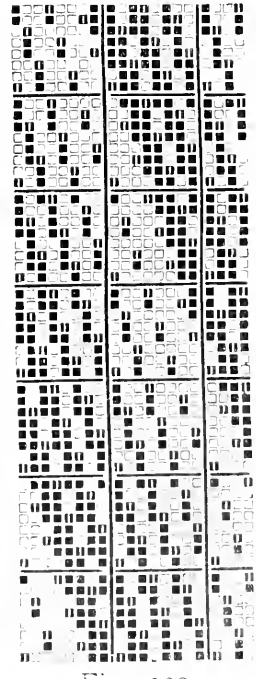


Fig. 317



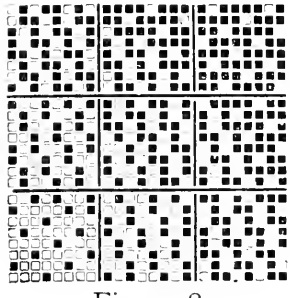


Fig. 318.

Fig. 319.

Fig. 320.

CORKSCREW WEAVES.

Corkscrews are derived from either satin or twill weaves. They resemble rib weaves, but are distinguished from these by having the rib running neither across nor lengthwise, but diagonally.

Corkscrews with uniform ribs are derived from satin and twill weaves with an odd number of shafts.

Warp corkscrews are obtained by adding points either upwards or downwards from the risers of a satin weave, Figs. 321 to 325.

Fig. 323a is the cloth corresponding to Fig. 323. A filling corkscrew is obtained by setting risers either to the right or left of the risers of a satin weave, Figs. 326 to 329. Fig. 326a is the cloth woven with Fig. 326.

For warp corkscrews satin weaves are used in which 2 is the rising number.

For filling corkscrews the smaller part of the number of threads in the pattern is taken for the rising number; for example, a 7-leaf satin is divided into 3 and 4, a 9-leaf satin into 4 and 5, 3 being used in the first and 4 in the second case as the rising number.

The reverse side of corkscrews is nearly the same as the face.

In warp corkscrews the filling is invisible; in filling corkscrews the warp is invisible, consequently the cost of such goods can be easily reduced by the use of cheaper material for filling in the warp weaves or for warp in the filling weaves.

The corkscrews so far described have but two ribs which lengthen with any increase in the number of shafts. It is possible, however, to make corkscrews with four ribs in the pattern, and being smaller they produce a finer face on the goods. The back of fabrics made in this way is very different from the face, but the feel of the goods is much better.

The filling satin indicated by (×), Fig. 330, is first drafted; the best results being obtained by using 4 as the rising number. The satin risers are then connected by inserting the risers indicated by (■), then the resulting filling ribs are filled in as indicated by (‖). Figs. 330, 331 and 332 show weaves of this kind in common use.

Corkscrews can be formed by dovetailing with itself a twill having an odd number of shafts.

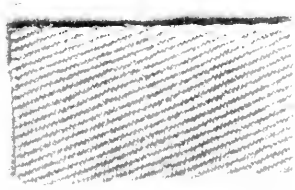


Fig. 323a.

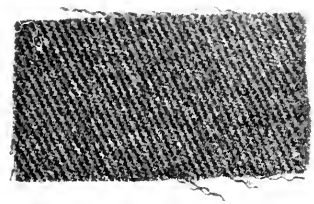


Fig. 326a.

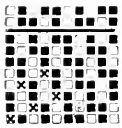


Fig. 321.

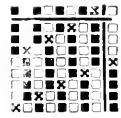


Fig. 322.

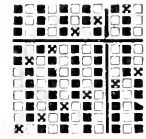


Fig. 323.

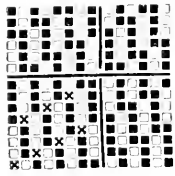


Fig. 324.

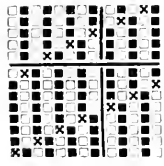


Fig. 325.

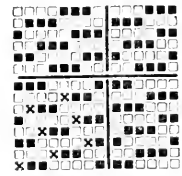


Fig. 326.

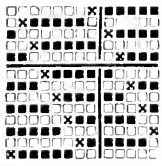


Fig 327

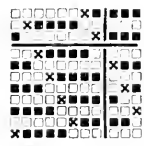


Fig 328.

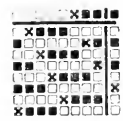


Fig. 329.

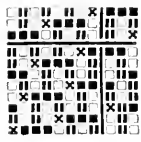


Fig. 330.

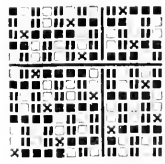


Fig 331.

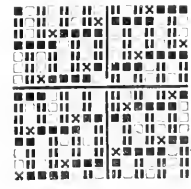


Fig 332

CORKSCREWS WITH RIBS OF TWO OR MORE SIZES.

These weaves are obtained by using floats of uneven length, Figs. 333 to 336. Fig. 333a is a sample of cloth corresponding to Fig. 333.

Corkscrews with two different sizes of ribs require twice as many warp as filling threads in the pattern.

Three different sized ribs call for the same number of threads in the warp and filling; four different sized ribs, twice as many threads in the warp as in the filling pattern.

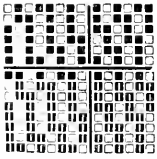


Fig. 333.

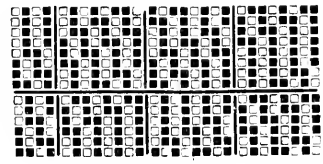


Fig. 334.

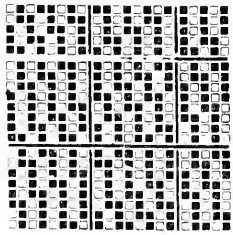


Fig. 335

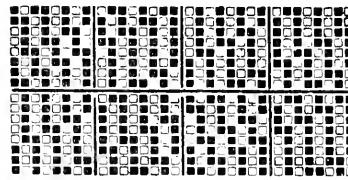


Fig. 336.

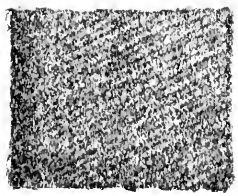


Fig. 333a.

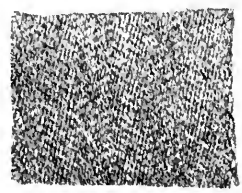


Fig. 338a.

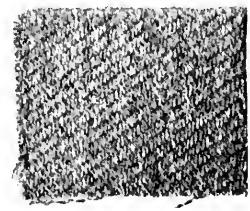


Fig. 342a.

FIGURED CORKSCREWS.

Figs. 337 to 341 are corkscrews showing figured effects.

In Figs. 337 and 339 the twill is curved. Fig. 338 is a zig-zag effect. Fig. 338a is a cloth corresponding to Fig. 338. Fig. 340 is a corkscrew with a graduated rib. Fig. 341 is a mosaic effect.

Each weave in a draft is distinguished by a different kind of type.

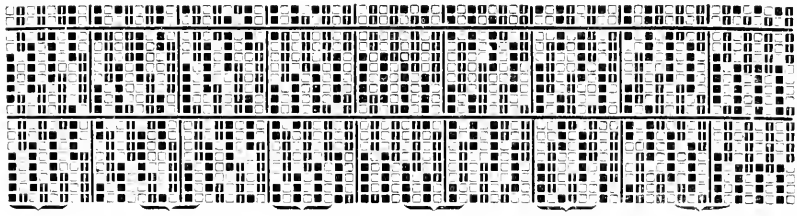


Fig. 337.

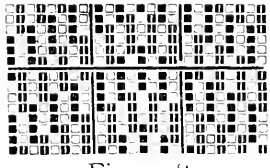


Fig. 338.

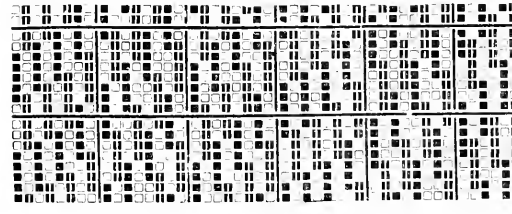


Fig. 339.

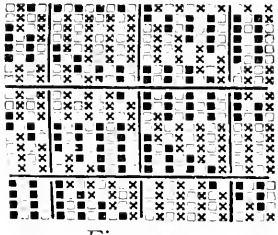


Fig. 340.

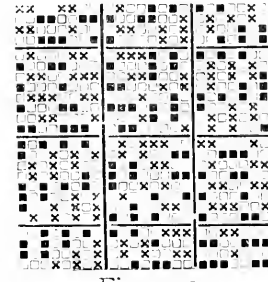


Fig. 341.

STITCHED CORKSCREWS.

Owing to the long floats of the threads, corkscrew fabrics made with a large number of shafts handle loose and slazy. To remedy this difficulty without changing the appearance of the face, single points (risers or sinkers) are inserted to increase the number of intersections.

In warp corkscrews these points are inserted where the warp threads float on the back and in Figs. 342 to 348 are indicated by (!!).

In filling corkscrews these points are inserted where the filling threads float on the face, and in Figs. 349 to 353 are indicated by the white squares. Fig. 342a (see page 70) is the cloth corresponding to Fig. 342.

This stitching of corkscrews makes the rib somewhat flatter and the back acquires more of a twill character and warps so woven run harder in the loom.

Warp corkscrews as well as warp satins are generally woven with the back side up. This makes the weaving easier and gives a clearer shed and better goods.

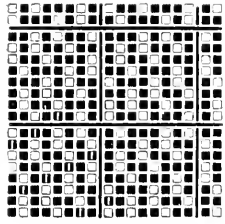


Fig. 342.

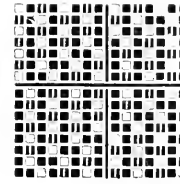


Fig. 343.

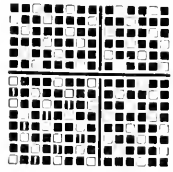


Fig. 344.

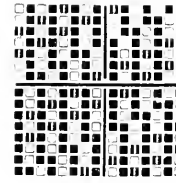


Fig. 345.

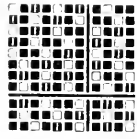


Fig. 346.

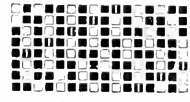


Fig. 347.

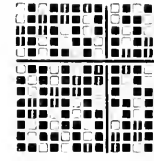


Fig. 348.

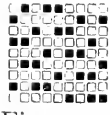


Fig. 349.

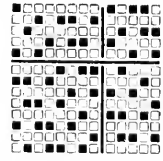


Fig. 350.

Fig. 351.

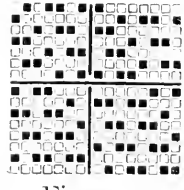


Fig. 352.

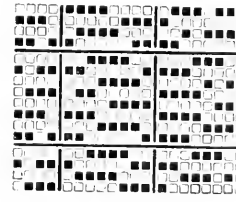


Fig. 353.

CRÊPE WEAVES.

These are obtained by inserting risers in filling satin weaves, which gives the goods a conglomerate appearance.

The more mixed the appearance is, the better is the crêpe effect. The points must be inserted in the satin weaves so as to produce neither long, cross nor diagonal lines nor figured effects.

In the best crêpe goods both warp and filling come to the surface to the same extent.

Samples of crêpe weaves are seen at Figs. 354 to 362, the satin weave being indicated in each case by (×). Fig. 356a (see p. 76) is the cloth corresponding to Fig. 356.

In Fig. 363 the satin weave is drafted on alternate threads.

Crêpe weaves are derived from plain, rib, twill and other weaves. The ground twill is first drafted and then points are either inserted or removed.

Fig. 364 is derived from a plain, Figs. 365 and 366 from a rib, Fig. 367 from a twill, Figs. 368 and 369 from a cross twill, and Fig. 370 from a broken satin weave.

Fig. 371 is a crêpe weave obtained by dovetailing a stitched twill with itself running in an opposite direction (a, b).

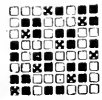


Fig. 354.

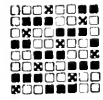


Fig. 355.

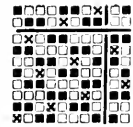


Fig. 356.

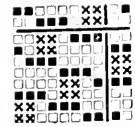


Fig. 357.

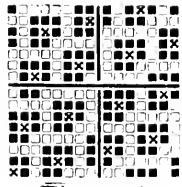


Fig. 358.

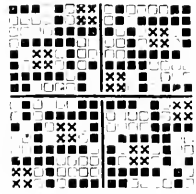


Fig. 359.

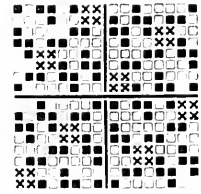


Fig. 360.

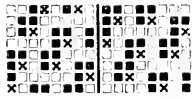


Fig. 361.

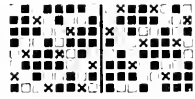


Fig. 362.

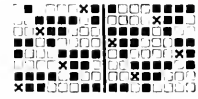


Fig. 363.

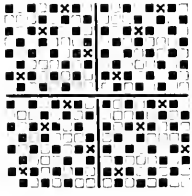


Fig. 364.

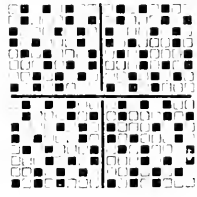


Fig. 365.

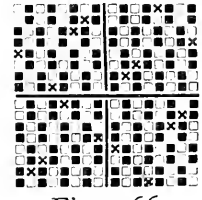


Fig. 366.

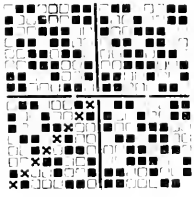


Fig. 367.

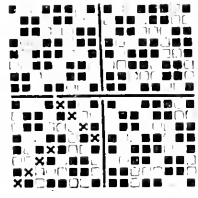


Fig. 368.

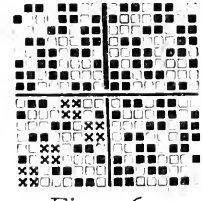


Fig. 369.

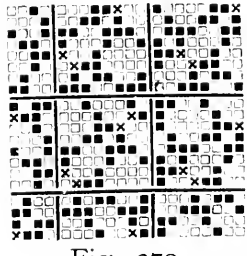


Fig. 370.

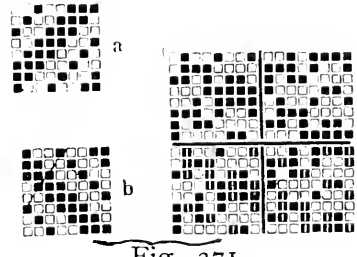


Fig. 371.

FIGURED WARP-SATIN AND CORKSCREW WEAVES.

In both warp-satin and warp corkscrew weaves the filling is nearly invisible. This enables the designer to produce figured effects by bringing the filling to the face. The effect is heightened by using contrasting colors for the warp and filling. The contrast must not be too strong, otherwise the filling will show through the warp in the ground work.

A weave with a polka dotted pattern is shown at Fig. 372. Fig. 372a is the motive that is transferred to the weave draft, Fig. 372. The motive has 4 threads and the weave draft 28 threads in the pattern, consequently each thread in the motive corresponds to 7 threads in the draft and the dots are produced by causing the filling to float as shown by (×). Fig. 372b is the cloth corresponding to Fig. 372. Figs. 373 and 378 are figured effects on a warp satin.

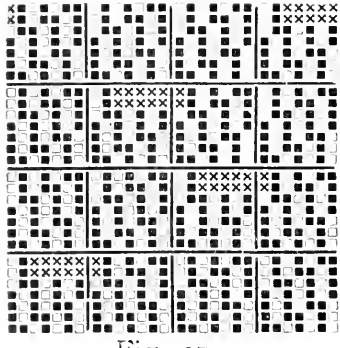


Fig. 372.

Fig 372a

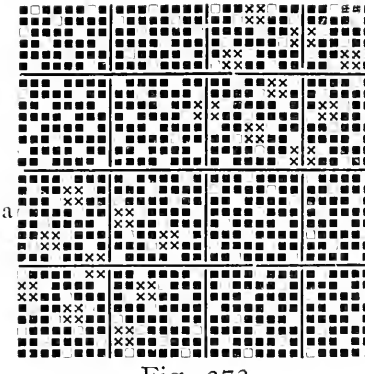


Fig. 373.

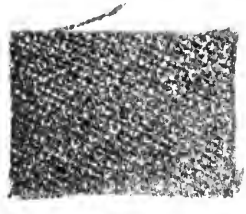


Fig. 356a.

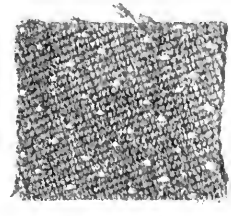


Fig. 372b.

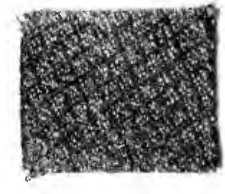


Fig. 377a.

Figs. 372, 374, 375, 376 and 377 are figured effects on a warp corkscrew. Fig. 377a is the cloth corresponding to Fig. 377.

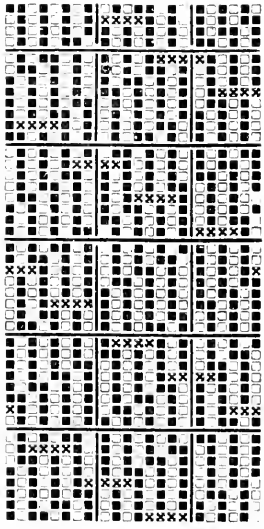


Fig. 374.

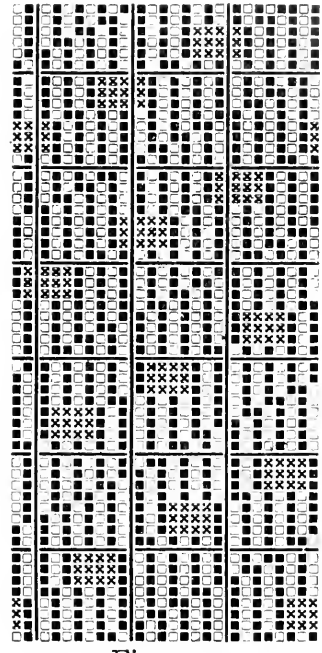


Fig. 375.

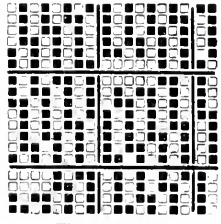


Fig. 376.

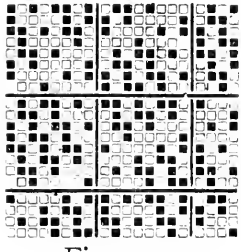


Fig. 377.

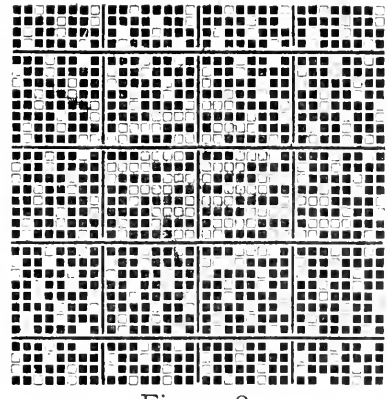


Fig. 378.

The appearance of the goods woven with satin weaves can likewise be changed by using different colors in warp and filling. With decided warp weaves the colors are introduced only in the warp, since the filling is almost entirely invisible and consequently the introduction of more than one color in the filling is useless and sometimes injurious. Warp satin and warp corkscrew weaves serve for stripes and the effect is changed by varying the arrangement and shade of the colors in the warp; the filling is usually made with one color. Beautiful effects can be produced with corkscrew weaves in combination with colors in the warp.

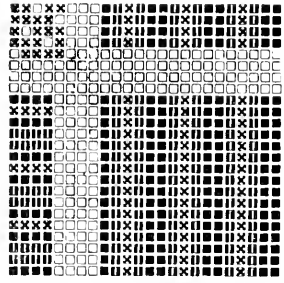


Fig. 379.

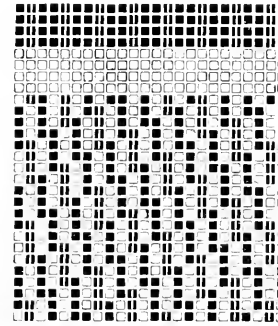


Fig. 380.

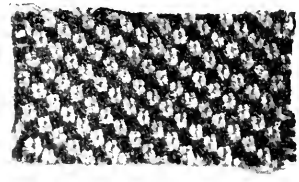


Fig. 383b.

Figs. 380, 381 and 382 are examples in which the warp pattern is indicated at the top of each weave. Fig. 379 is a stripe effect produced by colors in the warp of the satin weave. Patterns produced by the use of more than one color in both warp and filling are shown at Figs. 383, 384 and 385.

Fig. 383 is the weave; Fig. 383a shows the color effect.

Fig. 384 is the weave; Fig. 384a is the color effect. Fig. 385 is the weave; Fig. 385a, the color effect. Fig. 383b, on opposite page, shows the cloth.

The warp pattern is shown at the top, the filling pattern at the left of the drafts showing the color effects.

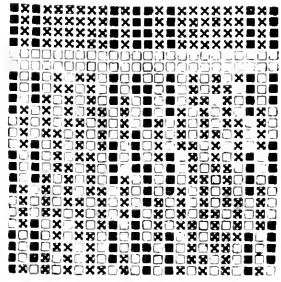


Fig. 381.

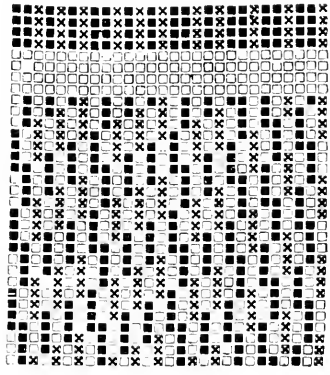


Fig. 382.

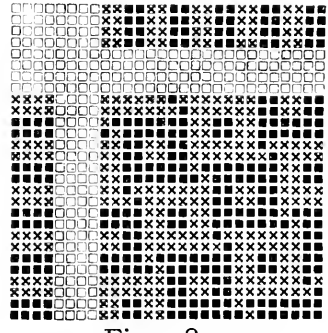


Fig. 383a

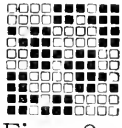


Fig. 383.

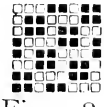


Fig. 384.

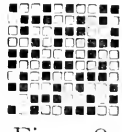


Fig. 385.

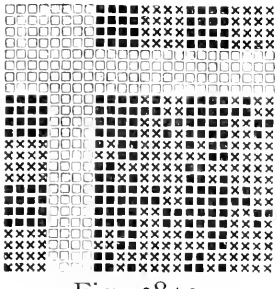


Fig. 384a

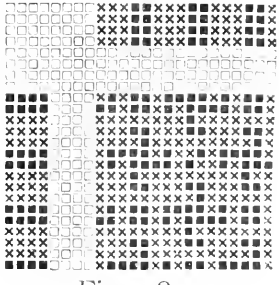


Fig. 385a

DRAWING-IN DRAFTS.

The drawing-in shaft is of great importance in shaft weaving. It enables large patterns to be woven on a shaft loom that would otherwise require a jacquard head.

The advantages of a practically arranged drawing-in draft are:

1. Reduction of the number of shafts,
2. Easy manipulation by the weaver,
3. The production of designs having a large number of threads in the pattern,
4. Advantageous distribution of the heddles,
5. Saving of the warp yarn,
6. A clear shed.

In reducing the number of threads by cross drawing the warp, the threads intersecting the filling in the same order are drawn on the same harness.

The harnesses with the greatest number of heddles, also those carrying the threads making the greatest number of intersections with the filling are placed in front next to the reed.

The shafts with the least number of heddles and

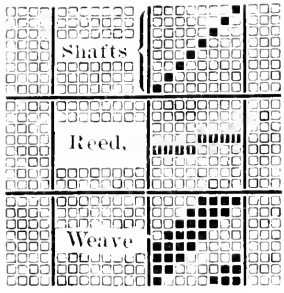


Fig. 386.

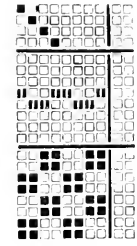


Fig. 387.

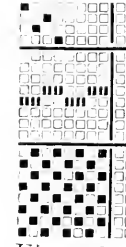


Fig. 388.

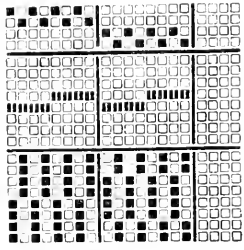


Fig. 389.

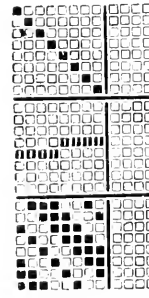


Fig. 390.

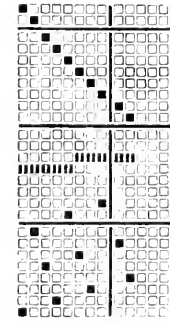


Fig. 391.

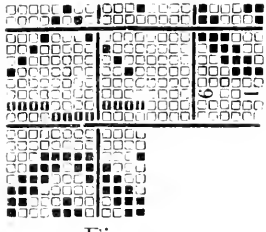


Fig. 392.

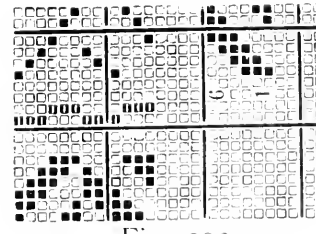


Fig. 393.

those carrying the threads making the smallest number of intersections with the filling, are placed at the back.

To make the drawing-in draft more readily understood by the weaver it is drafted in the direction in which the twill runs. The number of shafts depends somewhat upon the set of the fabric; the more threads there are in the warp the more shafts are required in order that too many heddles may not come on individual shafts and cause chafing of the yarn in the harness.

Drawing-in drafts are either straight or cross. Straight drafts are shown at Figs. 386, 387, 390 and 391.

Various forms of cross drafts are shown at Figs. 388, 389 and 392 to 398:

Scattered or satin, Fig. 388.
Pointed, Fig. 392.
Broken, Fig. 393.
Grouped, Figs. 389 and 394.
Double, Fig. 395.
Manifold or Corkscrew, Fig. 396.
Divided, Fig. 397.
Intermittent, Fig. 398.

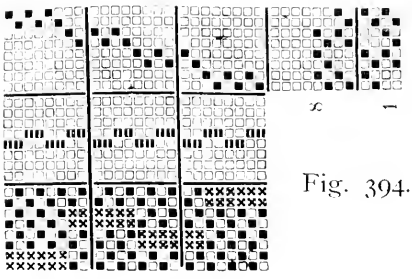


Fig. 394.

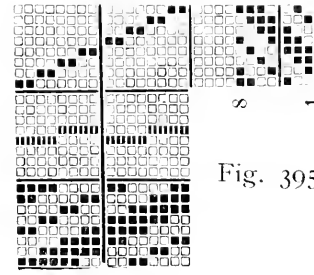


Fig. 395.

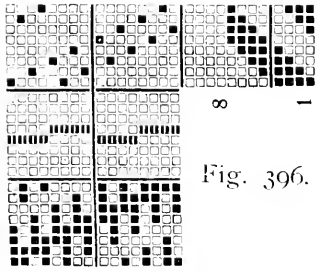


Fig. 396.

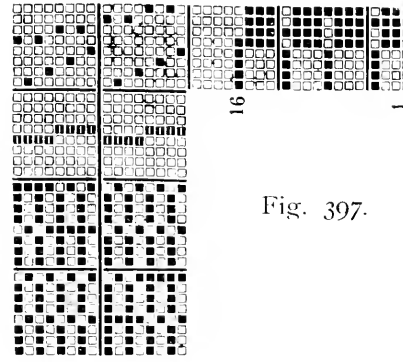


Fig. 397.

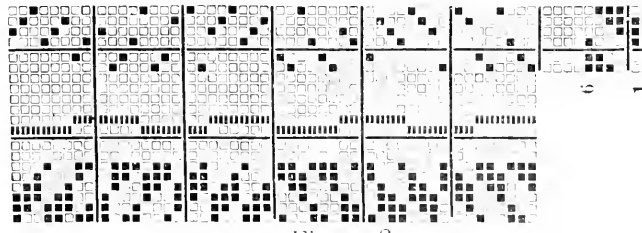


Fig. 398.

PIN CHECK WEAVES.

These form small squares or dots; the smaller the squares the better the appearance of the goods. For this reason these weaves are specially suited for close set fabrics made with fine yarn.

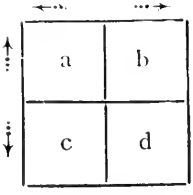


Fig. 399.

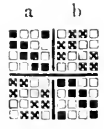


Fig. 400.

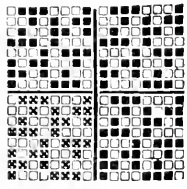


Fig. 401.

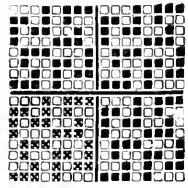


Fig. 402.

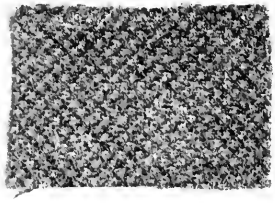


Fig. 401a.

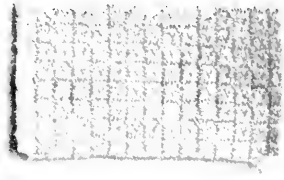


Fig. 412a.

The color pattern is made to correspond to the weave pattern. Balanced weaves with either 4 or 8 shafts give the best results.

Figs. 399 and 400 show the method of drafting a pin check weave. At "a" is the ground weave; at "b" this weave is reversed the warp taking the place of the filling and the filling the place of the warp; at "c" and "d" the weaves are the reverse of "a" and "b".

Figs. 400 to 412 show the more frequently used pin check weaves.

Fig. 401a is the cloth woven with weave shown at Fig. 401.

Fig. 412a is the cloth corresponding to Fig. 412.

In pin check goods the warp and filling should have the same set, that is, the same number of threads per inch, and the warp should be reeded so as to divide the weave pattern into even sections.

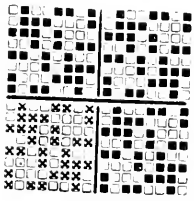


Fig 403.

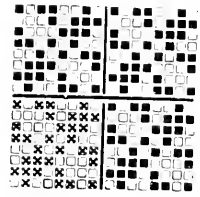


Fig. 404.

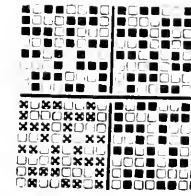


Fig. 405.

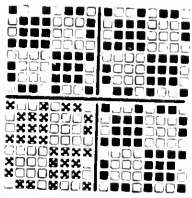


Fig. 406.

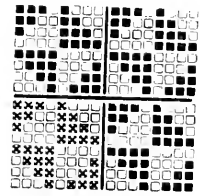


Fig. 407.

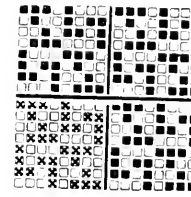


Fig 408.

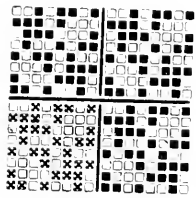


Fig. 409.

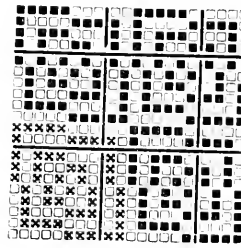


Fig. 410.

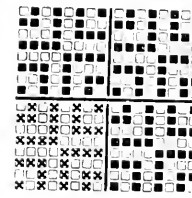


Fig 411.

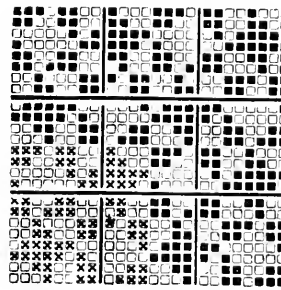


Fig. 412.

CHECKERBOARD WEAVES.

These are pin checks made on a larger scale. They show balanced twill lines radiating from a central point as at Fig. 413. or a regular checkerboard effect as at Fig. 420.

For the first named, balanced twills only are used, Figs. 413, 415 and 416.

Fig. 414 shows the color effect obtained with Fig. 413 by alternating two light and two dark colors in both warp and filling.

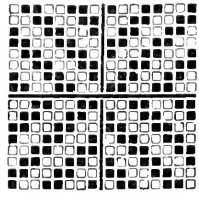


Fig. 413.

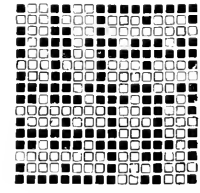


Fig. 414.

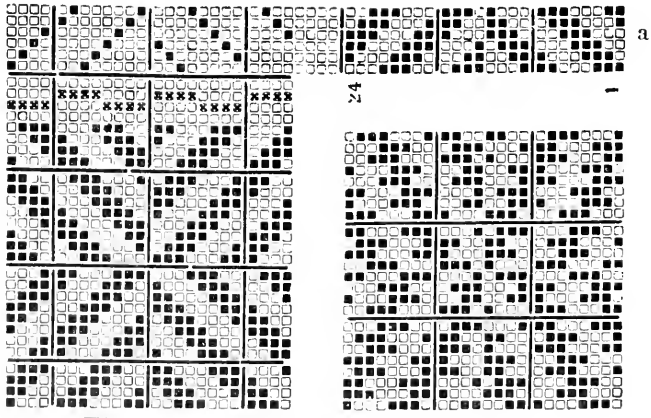


Fig. 415.

Fig. 416.

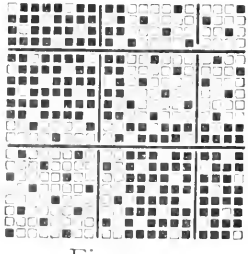


Fig. 417.

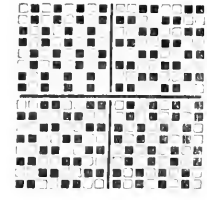


Fig. 418.

Fig. 421 is a combination of a basket and twill.

At Fig. 415 the weave or loom chain is shown at "a"; the drawing-in draft at "b"; the method of reeding at "c" by (×); the weave pattern at "d". "1" indicates the first and "24" the last pick in the filling pattern chain.

For the genuine checkerboard patterns, as at Fig. A, page 90, all pronounced warp and filling weaves are used, Figs. 417, 419 and 420. The draft is made as at Fig. 413, but instead of reversing a balance twill the effect is produced by alternating a warp with a filling weave.

A checkerboard effect can be obtained with a rib or with a corkscrew weave by alternating the regular weave with itself turned around 90°, Figs. 418 and 422.

The effect is obtained by the alternate appearance of the warp and filling on the face, and can be greatly increased by using contrasting colors in warp and filling.

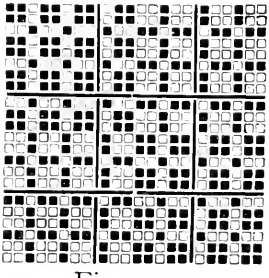


Fig 419.

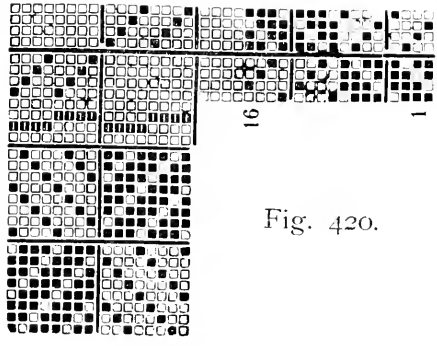


Fig. 420.

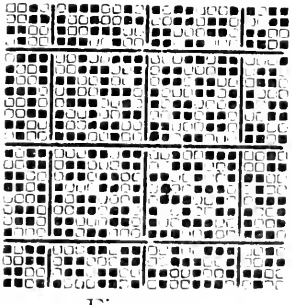


Fig. 421

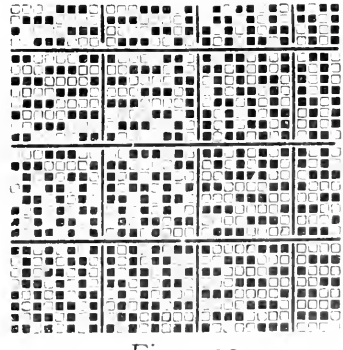


Fig. 422.

IRREGULAR CHECKS.

Various designs are produced by grouping small and large squares and oblongs made by alternating warp and filling weaves.

The motive is first drafted as at Fig. 423a for Fig. 423, and Fig. 424a for Fig. 424. The motive is then transferred to the drafting paper to cover the number of threads already decided upon for the pattern. Each square in the pattern must contain an even number of the ground weave patterns. The warp weave is then drafted on the colored squares and the filling weave on all other

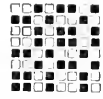


Fig. 423a

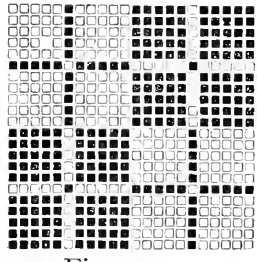


Fig. 424a

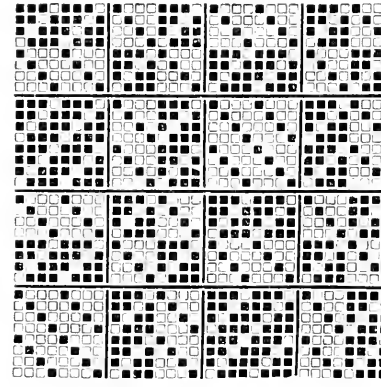


Fig. 423.

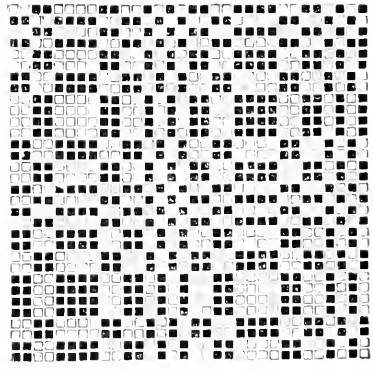


Fig. 425.

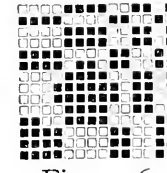


Fig. 426.

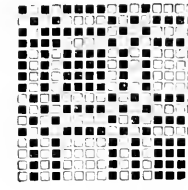


Fig. 427.

squares, Figs. 423 and 424. Fig. 424b is the cloth woven with Fig. 424.

The white spaces at the top and side of Fig. 424 indicate that the threads opposite each are taken 4 times.

Other motives are shown at Figs. 425. 426 and 427.

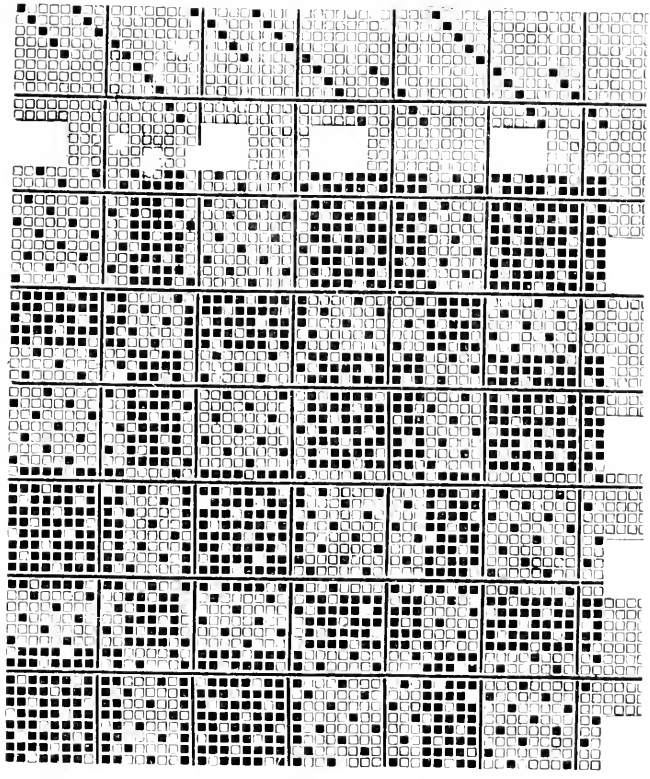


Fig. 424.

Fig. 424b.

HONEYCOMB WEAVES.

The high and low parts of these characteristic fabrics are formed by different intersections of the warp and filling.

Where the warp and filling threads float the farthest they lie on the face of the fabric causing a raised effect. Where they intersect each other frequently the low parts of the honeycomb weave are found.

For this reason these weaves require a certain grouping of loosely and tightly intersecting threads. Their construction is shown at Figs. 428 to 433.

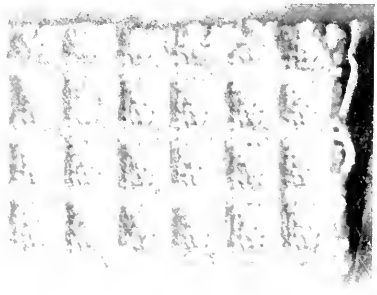


Fig. 428a.

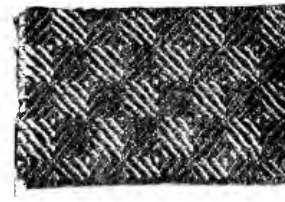


Fig. A. See page 87.
Checkerboard Pattern.

Fig. 428a is the cloth corresponding to Fig. 428.

In all of the above mentioned drafts except Fig. 430, two diagonal twill lines are drafted over the warp pattern and are shown by (×). One of the enclosed squares is then filled in with warp risers.

Figs. 434 to 437 are other examples of honeycomb weaves.

By using yarn that can be felted or shrunk the honeycomb effect is heightened in the finishing process.

Beautiful effects can be obtained by using bright colors in the warp and filling.

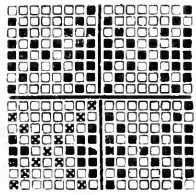


Fig. 428.

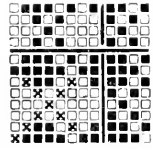


Fig. 429.

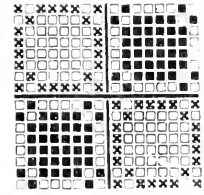


Fig. 430.

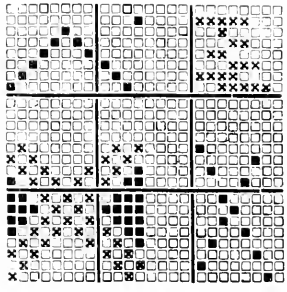


Fig. 431.

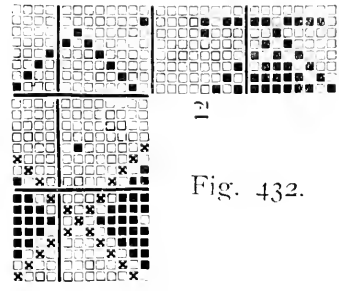


Fig. 432.

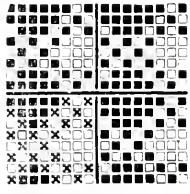


Fig. 433.

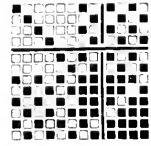


Fig. 434.

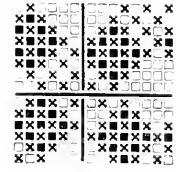


Fig. 435

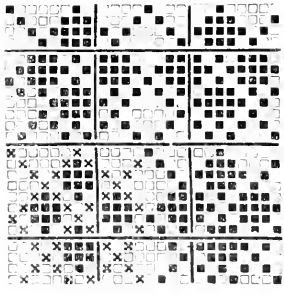


Fig. 436

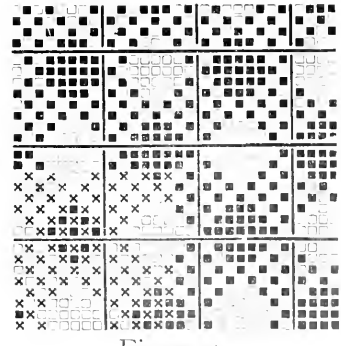


Fig. 437

HAIRLINES.

It is frequently necessary to produce hairline effects at certain places in the design. For this purpose the weave is drafted to fit the color pattern.

The motive is first sketched and then the warp color pattern is arranged to correspond.

The filling pattern is then drafted. The colors in the filling must be in the same proportion as those in the warp. The color that forms the greater part of the warp must also form the correspondingly greater part of the filling.

For example, if the warp is composed of two colors in equal proportions, the filling pattern will be 1 and 1 or 2 and 2. If, however, there should be three times as many threads of one color in the warp as of another the filling pattern will be 3 and 1, that is to say, three picks of one color predominating in the warp and only one of the other in the pattern.

The weave is now drafted in such a way that the warp threads of one color always intersect the filling threads of the same color. In this way, all of the filling threads of one color in the warp are raised over the threads of a different color in the filling and lowered only under the filling threads of the same color.

Where several colors are used in the filling each thread must intersect the warp but once in the warp pattern.

Figs. 438 to 444 are examples of hairline weaves.

Figs. 441 and 442, each show two filling patterns for the same hairline effect.

The warp pattern is shown at the top and the filling pattern at the left side of the draft.

Fig. 441a is the cloth corresponding to Fig. 441.

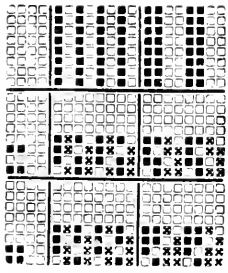


Fig. 438.

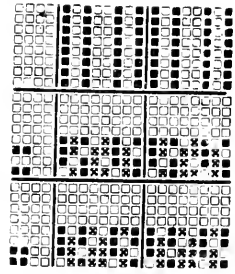


Fig. 439.

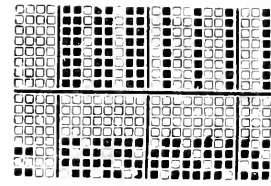


Fig. 440.

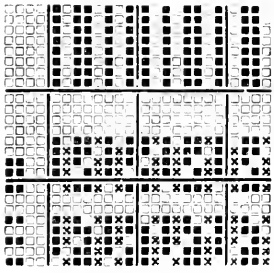


Fig. 441.

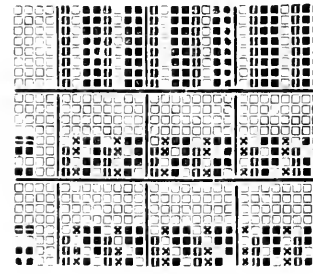


Fig. 442.

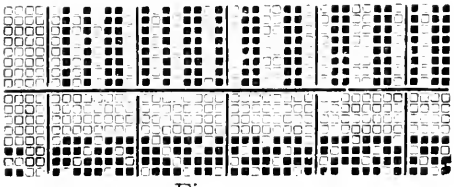


Fig. 443.

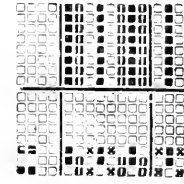


Fig. 444.

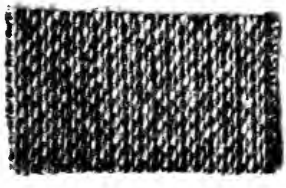


Fig. 441a.

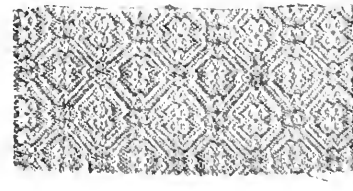


Fig. 445a.

PATTERNS MADE BY VARIATIONS OF SINGLE WEAVES.

Large weave patterns are made from a single weave by a variation of the drawing-in draft and by reversing the weave in the direction of the filling.

Figs. 445 to 450 are examples of these effects.

Fig. 445a is the cloth woven with Fig. 445.

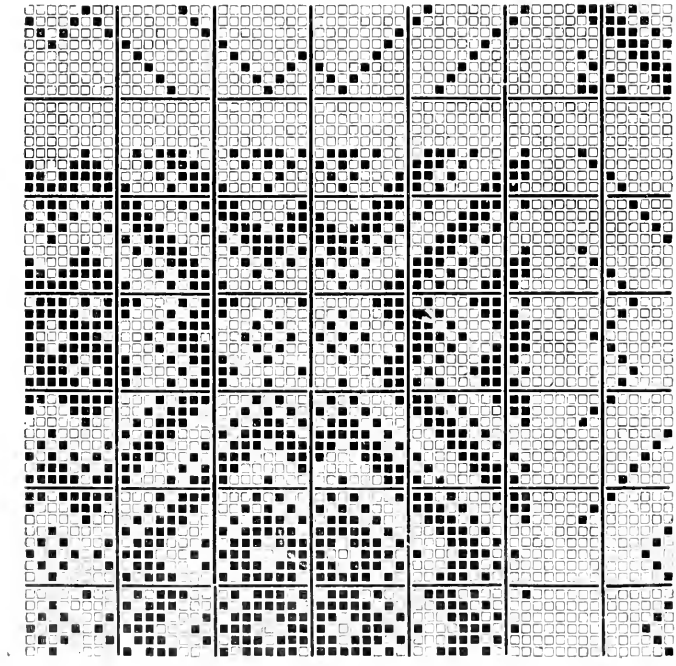


Fig. 445.

The drawing-in draft is shown at the top, the reversal of the weave in the filling at the side and the ground weave in the upper right hand corner of all except Fig. 450, where it is shown in the upper left hand corner.

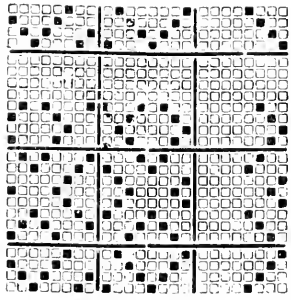


Fig. 446.

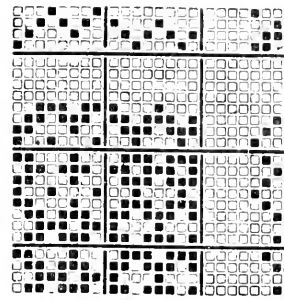


Fig. 447.

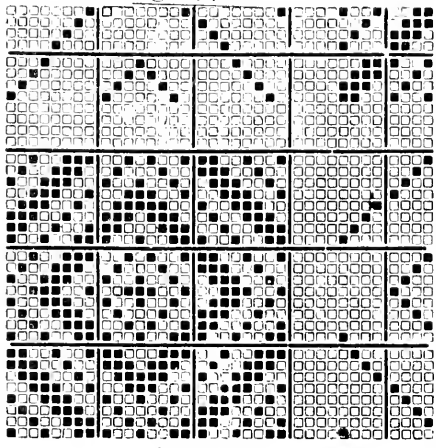


Fig. 448.

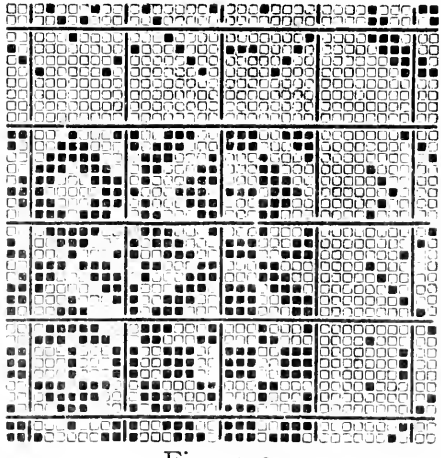


Fig. 449.

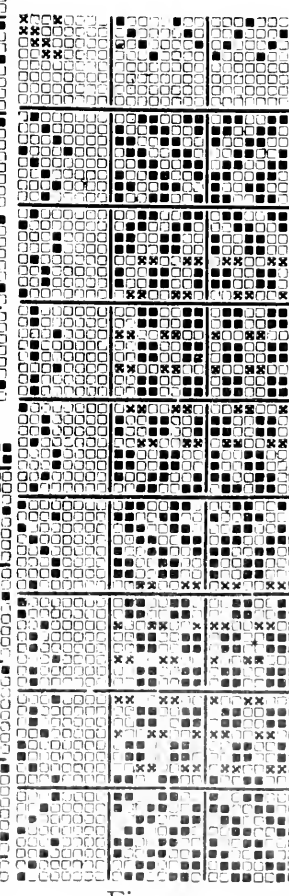


Fig. 450.

COMBINED WEAVES.

A large number of weaves are capable of being combined in the same fabric, forming stripes or plaid effects in the finished goods.

The selection of the weaves depends to a great extent upon the character of the material. In most fabrics a smooth face is desired.

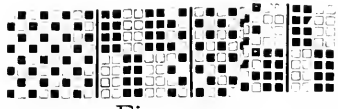


Fig. 451.

Fig. 452.

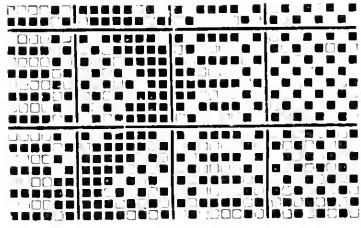


Fig. 453.

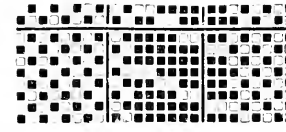


Fig. 454.

Fig. 455.

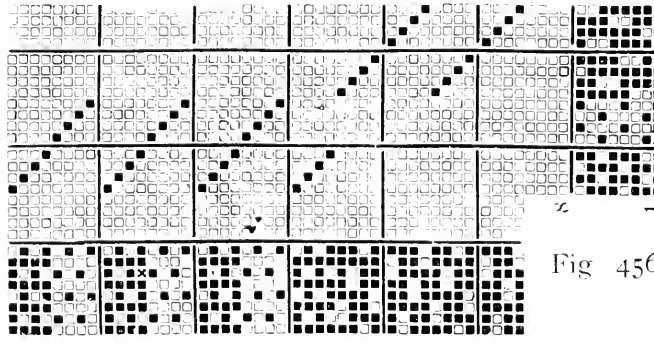


Fig 456

For goods made of woolen or felting material only such weaves can be combined as have practically the same number of intersections in each. In woolen fabrics the parts woven with less intersections shrink quicker than the other parts, causing a bagging of the cloth.

For goods made of cotton, linen, silk or other non-felting materials, less care need be taken to select for the combination, weaves having the same number of intersections, because an irregular shrinkage of the different weaves does not occur in finishing. The irregularities in the fabric are removed by sizing, dressing and pressing.

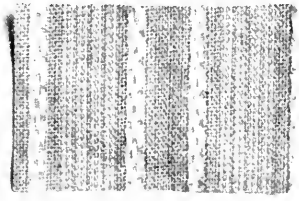


Fig. 451a

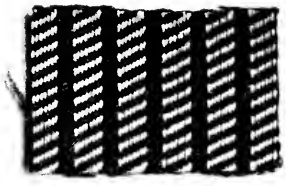


Fig. 452a.

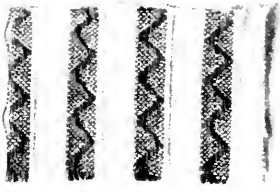


Fig. 453a.

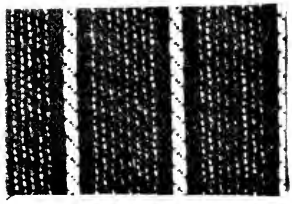


Fig. 454a.

If several loosely woven threads alternate with others more tightly woven a tight and a loose stripe result. This irregularity of tension develops in weaving, causing much breaking of the threads and a rough, imperfect fabric.

The irregularity of the tension is caused by a difference in the intersections of the threads, the warp threads with the greater number of intersections "take up" more in length.

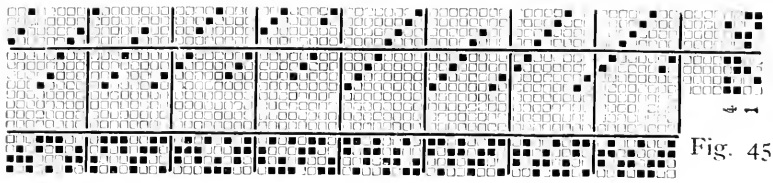


Fig. 457.

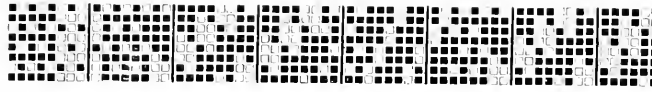


Fig. 458.

Fig. 459.

Fig. 460.

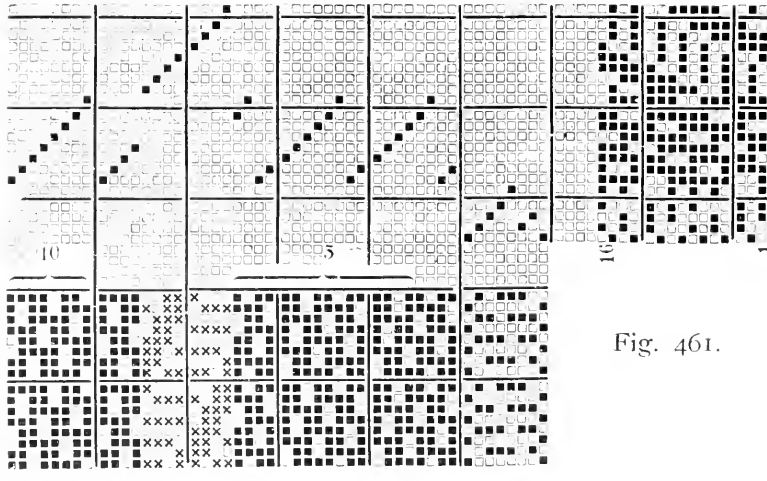


Fig. 461.

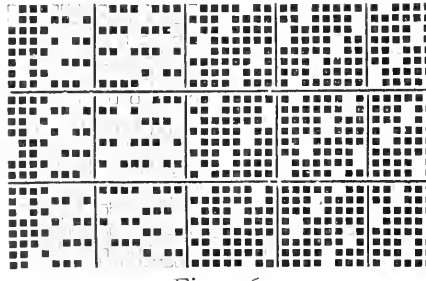


Fig. 462.

To overcome this difficulty separate warp beams are sometimes used for each kind of warp. The increase in the number of beams makes the weaving more difficult, increases the cost of the goods, and is therefore avoided if possible.

Figs. 451 to 463 are examples of combination weaves used for stripe effects.

Figs. 451a, 452a, 453a and 454a are cloths woven with Figs. 451, 452, 453 and 454 respectively.

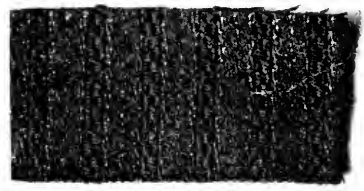


Fig. 462a.

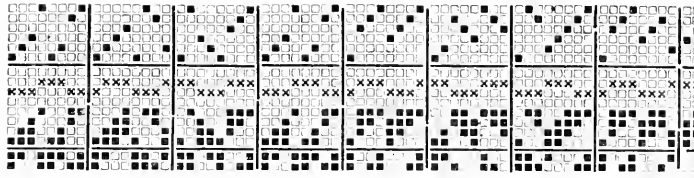


Fig. 463.

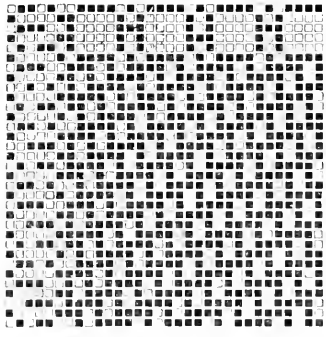


Fig. 464.

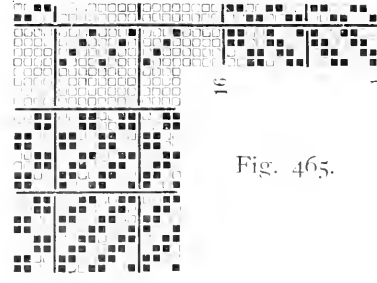


Fig. 465.

Fig 462a is the cloth woven with Fig. 462.

The 10 and 5 opposite the warp threads enclosed in brackets in Fig. 461 indicate that these threads are to be taken 10 and 5 times respectively.

Plaid effects are produced by the combination of long and cross stripes in the same weave. Figs. 464 and 465.

MOTIVES FOR FIGURED EFFECTS.

Figs. 466 to 486 are motives for various figured effects.

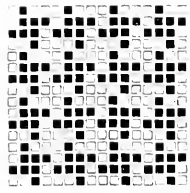


Fig. 466

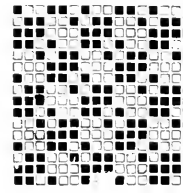


Fig. 467.

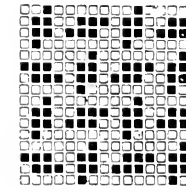


Fig. 468.

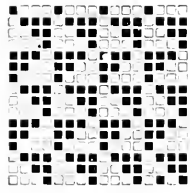


Fig. 469.

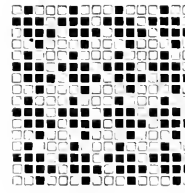


Fig. 470.

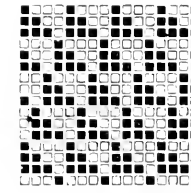


Fig. 471.

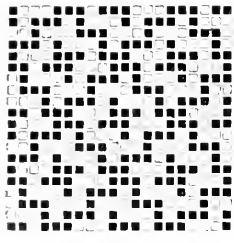


Fig. 472.

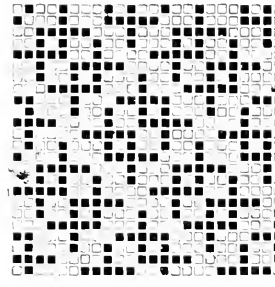


Fig. 473.

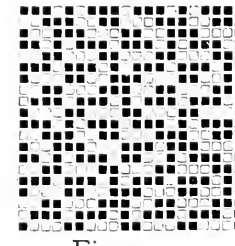


Fig. 474.

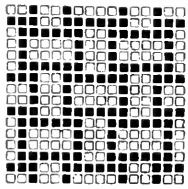


Fig. 475.

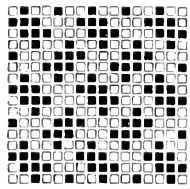


Fig. 476.

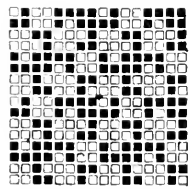


Fig. 477.

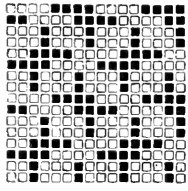


Fig. 478.

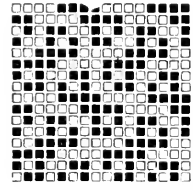


Fig. 479.

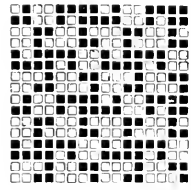


Fig. 480.

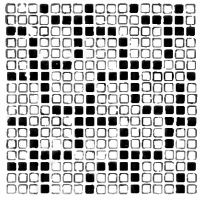


Fig. 481.

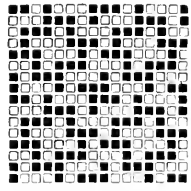


Fig. 482.

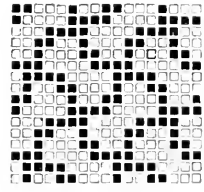


Fig. 483.

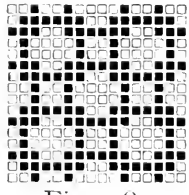


Fig. 484.

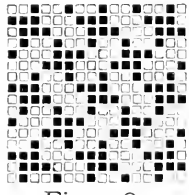


Fig. 485.

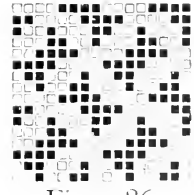


Fig. 486

THE TEXTILE WORLD

is a handsome illustrated monthly magazine of over 200 pages. It is the leading publication devoted to textile manufacturing interests, and is recognized in this country and abroad as the authority on all matters pertaining to textile processes and progress. Each issue contains articles relating to the processes in woollen, cotton, knitting and silk manufacture, from authorities in their respective lines, and describes the latest improvements in textile machinery coming on the market. It makes a feature of personal record, and has a most perfect chronicle of mill news, textile patents, etc. It invites correspondence from practical men, and pays liberally for accepted articles. Its Questions and Answers Department answers free of charge queries relating to textile matters; and mill men and overseers who wish advice or information in regard to any difficulties they may encounter in their work are aided by the practical suggestions not only of the editorial staff, but of experts in different departments, with whom arrangements are made for consultation.

Subscription price, $2 per year for United States, Canada, and Mexico.

In foreign countries, $3 per year.

THE TEXTILE WORLD OFFICIAL DIRECTORY OF THE TEXTILE INDUSTRIES

is published annually in the spring. It contains about 500 pages and over 20 textile maps showing the location of all the mills in the United States and Canada. It gives full information about each mill, officers, kind of goods made, etc.; also lists of manufacturers' selling agents, dealers in raw material, textile machinery and supplies.

The price of Directory, Office Edition, $2.50; Travellers' Edition, $2.

Combination price of Textile World one year and Travellers' Edition of Directory, $3.

GUILD & LORD, Publishers . . Boston, Mass.

LORD'S TEXTILE MANUALS.

This is the name of a series of practical handbooks on textile subjects written by acknowledged authorities, and intended to present the subjects of which they treat in a clear, concise, and systematic manner, so as to be helpful to students and beginners, and at the same time valuable to more experienced men and experts as books of reference. "A Manual of Weave Construction" is the first of the series, and will be followed shortly by others now in press and in preparation, of which the following is a partial list: —

I. **Manual of Weave Construction.** KASTANEK. Systematically arranged with explanation of the foundation and derivative weaves for harness looms. Published.

II. **Finishing Wool and Mixed Fabrics.** This handbook describes the early methods of finishing, and shows how a knowledge of them is of value to the finisher of to-day, and also describes at length the modern processes of finishing, taking up the different classes of fabrics in detail, also methods and machinery.

III. **Manual of Power Knitting.** HERINGTON. No complete handbook until this, has ever been published describing American methods of knit goods manufacture. This manual describes in detail the different classes of machines used in the manufacture of hosiery and knit goods, both spring and latch needle. It describes and explains the different stitches, and gives valuable information to manufacturers and knitters. It is profusely illustrated with engravings of both machinery and fabrics, stitches, diagrams, etc.

IV. **Wool Picking and Carding.** No complete treatise on this subject has been published in America during the last twenty years. Chapters on the subject have been written in connection with more complete books on the subject of woolen manufacture; but this little manual will describe in detail the adjustment and care of all the different machines in the card and picking room and discuss the different troubles which confront the carder, and suggests remedies for their correction. The book is written by Sam Driver, one of the best-known carders in the United States, and with probably wider experience in different mills than has fallen to the lot of any other wool carder. It embodies the experience of his lifetime, and he has withheld nothing of value that will help his fellow-craftsmen. His articles in the *Textile World* have been widely read and met with very favorable reception.

V. **Dyeing and Bleaching of Cotton Yarn and Knit Goods.** This manual is prepared by a practical dyer, who knows just what dyers want to know, and, better still, knows how to tell it. While it will be scientifically accurate and technically correct, it will be written especially from the standpoint of practical work in the dyehouse and bleachery, describing apparatus best adapted for different purposes, telling how the goods should be handled and all the details which are too often omitted from pretentious works on dyeing and chemistry.

VI. **A Vest Pocket Memoranda for Cotton Weavers.** This little book while not one of the regular textile manual series in point of size, is full of valuable information for overseers, second hands, section hands and loom fixers in cotton weave rooms. It is prepared by the superintendent of a cotton mill; and, while containing many rules and calculations that have been printed before, the whole subject is presented from the standpoint of the every-day mill man, and much new information and many suggestions are given here for the first time. It is a little book that can be slipped into the vest pocket and easily consulted as occasion requires. Price will be 50 cents.

GUILD & LORD, Publishers . . Boston, Mass.

LIBRARY OF CONGRESS
0 018 533 047 3